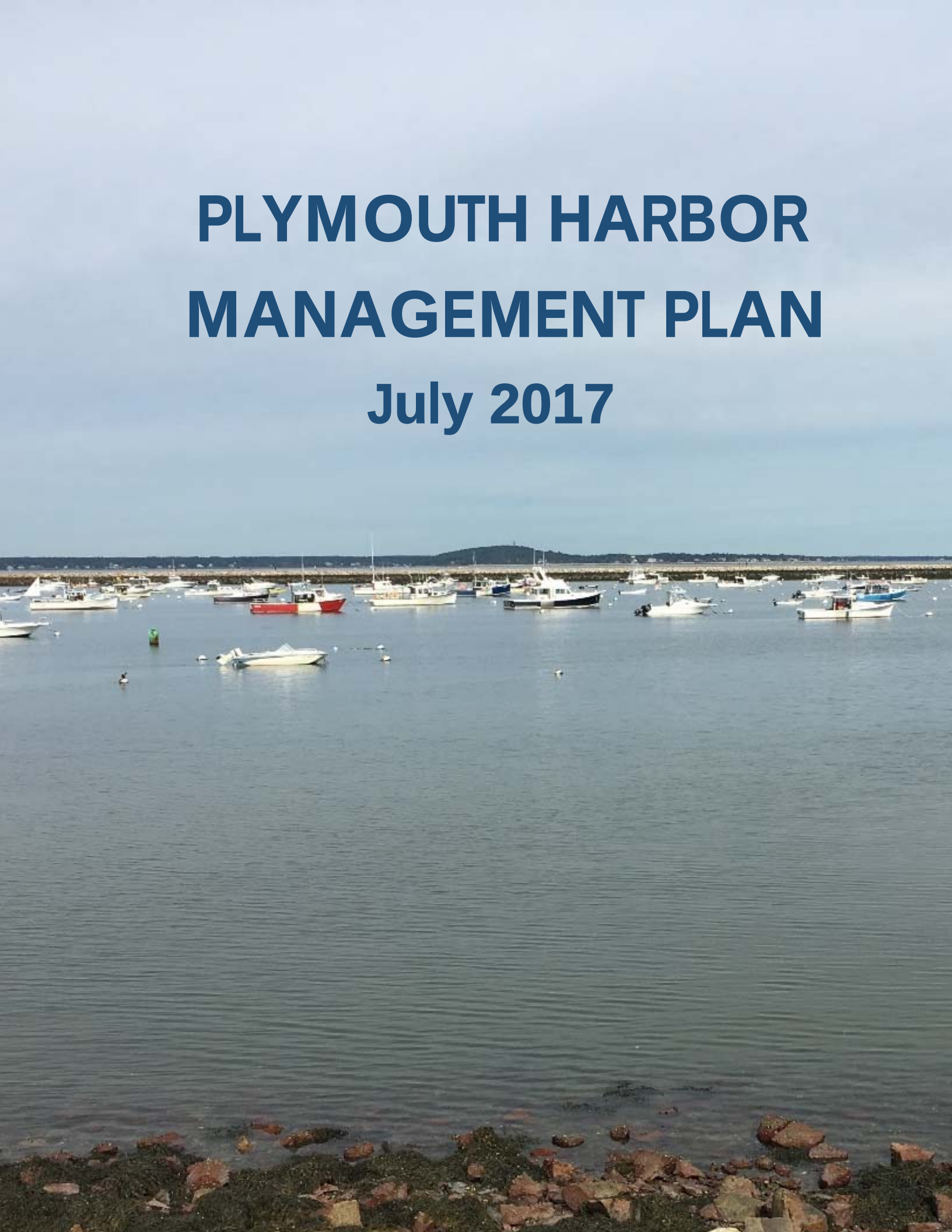
PLYMOUTH HARBOR MANAGEMENT PLAN

July 2017



Prepared by the Urban Harbors Institute, University of Massachusetts Boston

On Behalf of the Town of Plymouth

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Section 1: Purpose, Scope, and Authority of the Plan

The purpose of the Plymouth Harbor Plan is to provide the Town and other stakeholders with information and resources needed to understand, protect, and enhance the harbor's economic, cultural, and natural resources within the context of relevant laws, policies, and regulations.

Through the goals, objectives, and recommendations, the plan seeks to respect the public's rights in intertidal areas and lands lying seaward of the low water mark, as afforded by the Public Trust Doctrine, and embraces the spirit of the Colonial ordinance throughout the planning area, enhancing access where possible and taking measures to protect and preserve the resources held in trust for all.

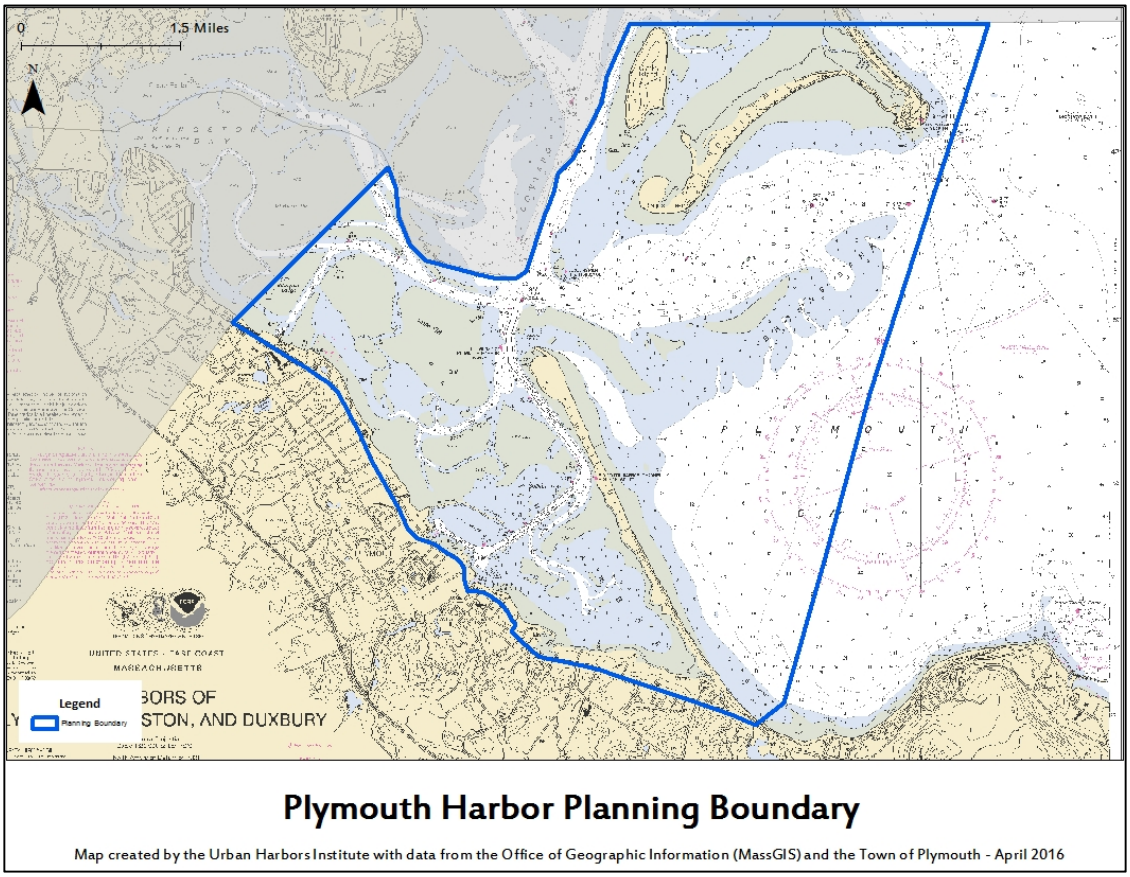
The plan sets forth a series of short-term and long-term goals, objectives, and recommendations to address the needs and opportunities related to: dredging, transient boating, moorings, public access, commercial fisheries/aquaculture, natural resources, water quality, harbor safety, climate change, and tourism and education.

As a municipal harbor plan, the Town will collaborate with entities identified throughout the document in order to complete the recommendations. An implementation matrix (Appendix A) can be used to track and report progress for a variety of audiences including the Board of Selectmen and the general public.

The plan should be reviewed and updated every five years by the Plymouth Harbor Committee; and reports on the status of the plan's implementation should be provided to the Board of Selectmen on an annual basis.

This plan was funded by the Plymouth Growth and Development Corporation and the Massachusetts Seaport Economic Council.

Section 2: The Planning Area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Plymouth Harbor Planning Boundary
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - April 2016

Figure 1: Plymouth Harbor Planning Boundary

The boundary of the Plymouth Harbor Management Plan (Figure 1) encompasses the downtown harbor area, as well as Brown's Bank, the town's portion of Saquish, Clark's Island, and the shoreline extending back to the first major road. More specifically, starting at Cordage Park, the boundary follows the railroad tracks and bike path south to Water Street, passes through downtown along Water Street, meets and follows Union Street, and then connects to Route 3A. At a point near Plimoth Plantation, the boundary extends northeast into the ocean, meeting and then following the offshore boundary with Duxbury. The plan boundary continues westward along the offshore town boundary and remains contiguous with the offshore boundaries of Duxbury and Kingston as it extends southwest to Cordage Park.

The planning boundary is a tool to focus harbor planning activities. It is worth noting that the issues identified in this plan may extend beyond the planning boundary and that the impacts of recommendations may also extend beyond the plan's boundary. Additionally, while Long Beach is included in the Harbor Planning Area, it will not be a focus of this harbor plan given the extensive planning and management already in place for the beach and its resources.

Section 3: The Planning Process

The planning process was guided by town staff and the Plymouth Harbor Planning Subcommittee, which included:

- Len Blaney, Chair
- Wrestling Brewster
- Scott Dunlap
- Marc Garrett
- Chet Gwardyak
- Chad Hunter
- Tim Moll

The planning process was designed to capture stakeholder input, kicking off with a series of four public meetings:

- February 4, 2016 – General public meeting
- March 3, 2016 -- Focus on commercial users
- April 7, 2016 -- Focus on land-based abutters and users
- May 5, 2016 -- Focus on general public

The meetings were well attended, with more than 40 people present at each meeting.

In addition to the meetings, information about the planning process was available on the Harbormaster's website as well as at the Plymouth Public Library.

Stakeholders were encouraged to contact members of the Harbor Planning Committee and Staff from the Urban Harbors Institute with any questions or comments. A specific email address, plymouthharborplan@gmail.com, was established to facilitate communication.

The planning team also held meetings with key stakeholders and Town officials to ensure that the plan reflected and was consistent with current and anticipated projects.

A draft of the plan was released for public comment in February 2017.

Public meetings on March 16 and April 6, 2017 allowed members of the public to provide comment on the draft plan, and changes were incorporated into this final plan.

Section 4: Inventory of Harbor Uses and Resources

Understanding the harbor's natural, economic, and cultural resources is critical to evaluating the needs and opportunities within the planning area. To that end, this section provides background information to contextualize the plan's goals, objectives, and recommendations.

Furthermore, in documenting the current status of harbor activities and conditions, this section creates a reference against which to measure the impacts of this plan's recommendations once they are fully implemented.

4.1 Harbor Hydrodynamics

Plymouth Harbor, like many parts of the eastern coast of North America, experiences semidiurnal tides, meaning the tide cycles through a high tide and a low tide of approximately equal size each lunar day. More specifically, the mean tidal range in the Harbor is 9.76 feet[1], and the period between two successive high tides or two successive low tides is approximately 12.42 hours[2].

Part of a larger embayment shared with Duxbury and Kingston, the features of the area – including the path of the inlet's main ebb channel – were formed as a result of the deglaciation process[3]. These physical features impact the rate of tidal exchange, sedimentation, and overall water quality in the embayment.

The Harbor is well-flushed, with a tidal exchange of approximately 66% in the larger Plymouth-Kingston-Duxbury Bay system[4]. The velocity of the current in the channel near the tip of Plymouth Beach was measured in 2012 as part of The School for Marine Science and Technology's study on nitrogen in the Plymouth-Duxbury Harbor-Kingston Bay Embayment System. The results indicate tidal exchange is dominated by the flood tide phase of the tidal cycle, as opposed to the ebb phase. The mean current velocity in the channel during a flood tide was measured at 0.46 m/sec (0.89 knots). The mean current velocity in the channel during an ebb tide was measured at 0.41 m/sec (0.8 knots)[5].

[1] NOAA. 2013. Tides & Currents. Plymouth, Plymouth Harbor, MA – Station ID:8446493. Online at: https://tidesandcurrents.noaa.gov/stationhome.html?id=8446493.

[2] Irish, J.D. & R.P. Signell. 1992. Tides of Massachusetts and Cape Cod Bays. Technical Report WHOI-92-35. Online at: http://www.dtic.mil/dtic/tr/fulltext/u2/a264790.pdf

[3] FitzGerald, Duncan M. 1993. Formation and Evolution of Multiple Tidal Inlets. Coastal and Estuarine Studies, Vol. 44, pp1-61.

[4] Davis, J. 1984. Western Cape Cod bay: Hydrographic, Geological, Ecological, and Meteorological Backgrounds for Environmental Studies. Online at: https://books.google.com/books?id=oXvdBwAAQBAJ&pg=PA9&lpg=PA9&dq=plymouth+duxbury+kingston+flushing+tidal&source=bl&ots=qy1PtZFsXW&sig=SsjCNgDFvgdShaloo1fRROR0SSs&hl=en&sa=X&ved=0ahUKEwj5ufSrjITVAhVHFT4KHdcgBh4Q6AEIPDAE#v=onepage&q=plymouth%20duxbury%20kingston%20flushing%20tidal&f=false.

[5] Howes, B., Samimy, R., Schlezinger, D., and Bartlett, M. 2013. Technical Memorandum Re: Hydrodynamic Data Collection in Partial Fulfillment of the Massachusetts Estuaries Project Linked Watershed-Embayment Nitrogen Management Approach for the Plymouth-Duxbury Harbor-Kingston Bay Embayment System. Online at: https://www.plymouth-ma.gov/sites/plymouthma/files/uploads/projects_plymouth_hydro_tech_memo_2012_working_061813_ld-blhris.pdf.

4.2 Water Quality

Plymouth's ponds, streams, and estuarine waters support a diverse mix of human uses, and provide important habitat and ecosystem services; however, the quality of these waters is impacted by multiple human-related activities such as fertilizing, improper septic system maintenance, sewer leaks, vessel-based waste discharges, and other stressors such as the presence of the waste water treatment facility's outfall. Under Section 303(d) of the Clean Water Act, Massachusetts is required to identify waterbodies that fail to meet water quality

standards established by the U.S. Environmental Protection Agency.

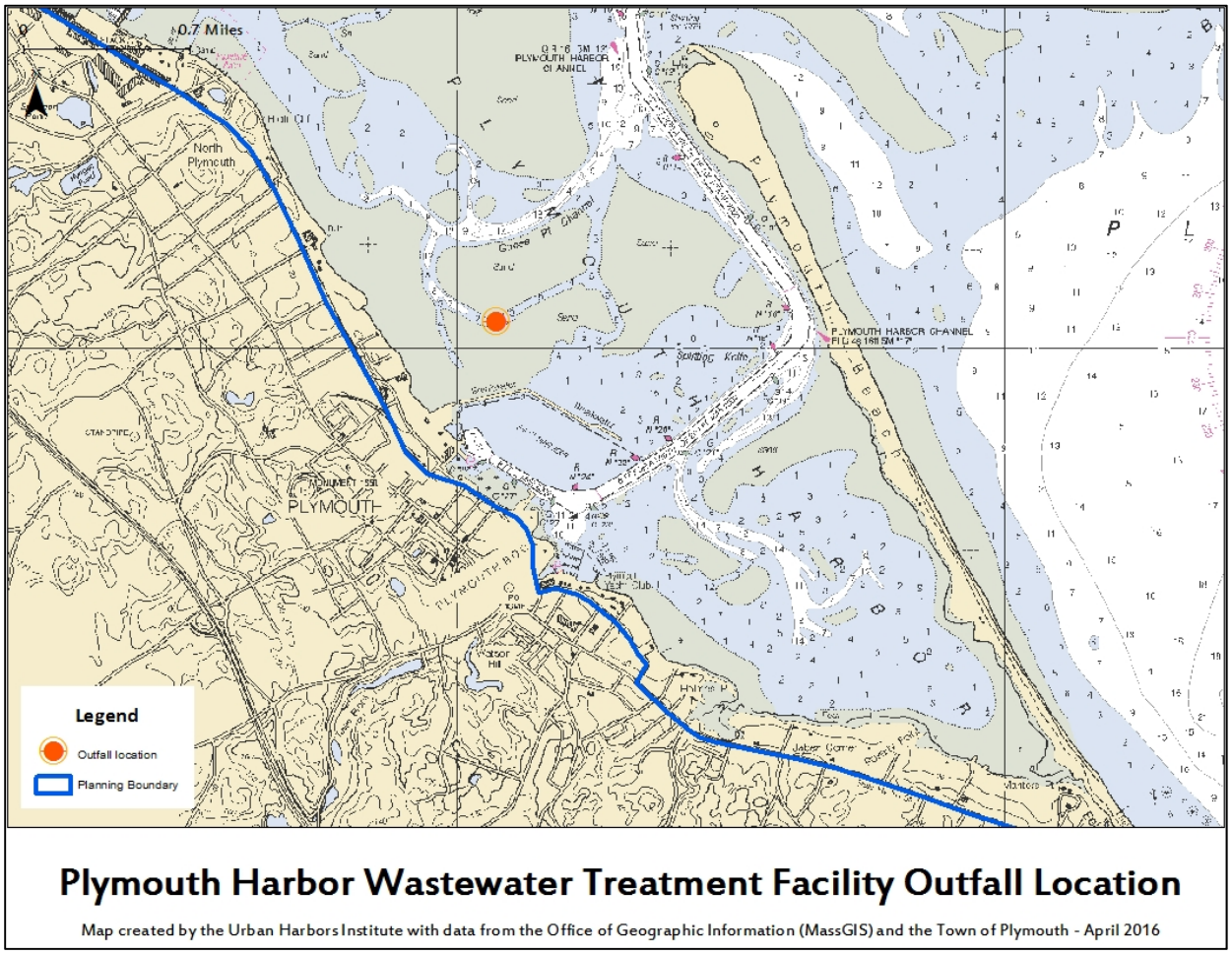
Plymouth Harbor is identified as failing to meet water quality standards due to its fecal coliform and nutrient contamination. Listed as a Category 5 waterbody (*i.e.,* a pollutant-caused impairment requiring a TMDL), a plan is needed to (1) identify the Total Maximum Daily Load (TMDL) of pollutants that the Harbor can receive and still meet water quality standards, and (2) determine strategies to reduce pollution to achieve the TMDL.

As part of this, the Town, along with Duxbury and Kingston, is working with the Massachusetts Estuaries Project to address water quality issues and restore and protect the health of the embayment system. Together, they are establishing nitrogen loading targets and developing strategies to limit nitrogen inputs into the bay. The final report is expected by the end of June 2017. Recent Town-collected data show a slight increase in total nitrogen by 0.1mg/L since the waste water treatment facility went online in 2002; however, there have been fluctuations throughout the years and no outliers were excluded in calculations.[6] The wastewater treatment facility and additional stressors, as well as actions by the Town to address water quality concerns, are described below:

Wastewater Treatment Facility

The Town's wastewater treatment plant went online in May of 2002, replacing a facility from the 1970s. With a capacity of 3 million gallons per day (MGD), the plant collects, treats, and discharges municipal and industrial wastewater. Their National Pollutant Discharge Elimination System (NPDES) permit allows for an annual average discharge of 1.75 MGD via the Plymouth Harbor outfall, located on the Harbor floor just south of Goose Point Channel (see Figure 2), with the remaining 1.25 MGD capacity discharged

[6] K. Tower. November 1, 2016. Personal communication regarding the Town's water quality monitoring.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Outfall location
Planning Boundary
Plymouth Harbor Wastewater Treatment Facility Outfall Location
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - April 2016

Figure 2: Plymouth Harbor Wastewater Treatment Facility Outfall Location

into the facility's groundwater infiltration basins. Currently, an average of 1.75 MGD of treated effluent is discharged via the ocean outfall and approximately 0.2 MGD is discharged via the groundwater infiltration area.[7]

Approximately one mile from the facility, a parcel of land has been reserved as an alternate site for disposal, should that be necessary to address future wastewater needs.[8]

Sewer

While much of the Town is on septic systems, most of the properties within the Harbor Planning Boundary are connected to the Town sewer system. In December of 2015, the Town experienced a sewer leak due to hydrogen sulfide-based corrosion of steel sewer pipes that had only been in the ground for 15 years. At the 2016 Annual Town meeting, voters approved borrowing $48,200,000 to pay the costs associated with "temporary and/or permanent repairs to sewer lines, including but not limited

[7] *Ibid.*

[8] Plymouth Planning board Master Plan Committee. 2006. Town of Plymouth, Massachusetts Master Plan, 2004-2024.

to repair of line breaks and related failures, and/or for the costs of improvement or repair of the Town's sewer system in general…."[9]

No Discharge Zone

Plymouth Harbor, along with all other coastal waters of Massachusetts, has been designated a No Discharge Zone (NDZ) by the US EPA. Plymouth, Kingston, and Duxbury harbors received their NDZ designation on July 20, 2006.[10] As an NDZ, boaters are prohibited from discharging treated and untreated boat sewage into the Harbor. Town by-laws reinforce the requirements of the NDZ, prohibiting the discharge of treated or untreated sewage from a Type I and Type II marine sanitation device. [11] In order for boats to comply with the local and federal requirements, the Town provides pump-out services for boaters looking to empty their holding tanks.

Water Quality Monitoring [12]

Town of Plymouth municipal data collection for Plymouth Harbor began in 1998 to evaluate pre and post Wastewater Treatment Facility operations for permitting pertaining to impacts associated with groundwater influence in the Eel River Watershed. Increased nitrogen values, among other nutrients, are of particular concern in relation to depletion of eel grass.

Per the Groundwater Discharge Permit, the Town collects samples two times per year between June-September at the following two harbor locations, as showing in Figure 3, during the first hour of high slack tide:

- S-7 Coordinates: -70 38'23.59W, 41 57'8.35"N

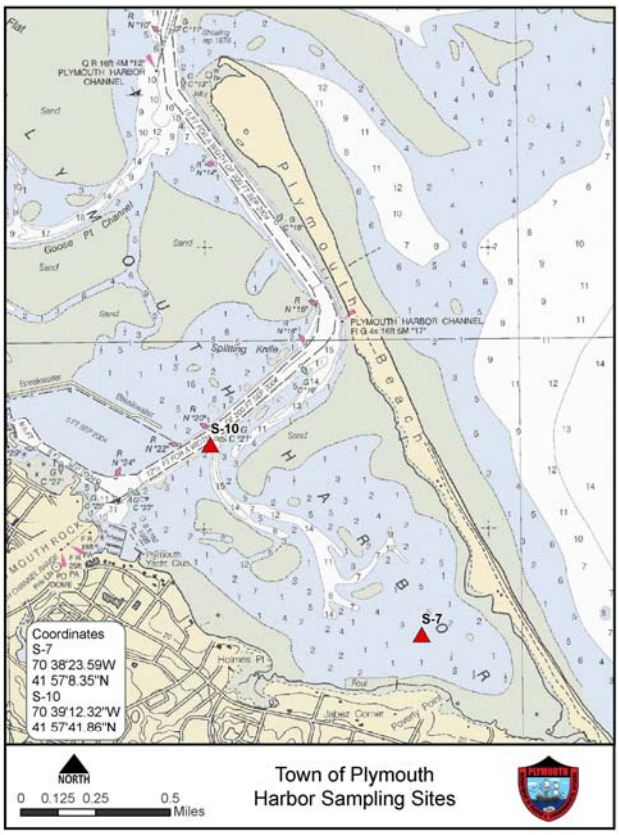


Figure 3: Plymouth Harbor Wastewater Treatment Facility Outfall Locations

- S-10 Coordinates: -70 39'12.32"W, 41 57'41.86"N

Samples are analyzed for the following: Ortho Phosphates (mg/L), Total Phosphorus (mg/L), Total Kjeldahl Nitrogen (mg/L), Ammonia-N (mg/L), Nitrate (mg/L), Nitrite (mg/L), Total Nitrogen (mg/L), Total Dissolved Nitrogen (mg/L), Dissolved Inorganic Nitrogen (mg/L), Dissolved Organic Nitrogen (mg/L), Particulate Organic Nitrogen (mg/L), Particulate Organic Carbon (mg/L).

[9] Town of Plymouth. 2016. Special Town Meeting. Online at: http://www.plymouth-ma.gov/sites/plymouthma/files/uploads/stm416.pdf (Last visited 6/9/2016).

[10] US EPA. No Date. "No Discharge Zones" in Massachusetts. Online at: https://www3.epa.gov/region1/eco/nodiscrg/ma.html#ply.

[11] Plymouth Town Bylaws §81-4

[12] This monitoring section was written by K. Tower, Town of Plymouth Environmental Technician

Per the updated (2016) National Pollutant Discharge Elimination System (NPDES) permit for the Wastewater Treatment Facility, harbor, samples are collected four times per year between June-September within 2-4 hours following high slack tide. In addition to the above parameters, Chlorophyll-a (ug/L) is collected as are field parameters including temperature, dissolved oxygen, and salinity for the NPDES permit. A total of 7 water samples were collected during pre-wastewater treatment facility operation and a total of 27 were collected post-operation thru 2015. The baseline total nitrogen average for sample site S-7 is 0.328 mg/L with a post-operation average of 0.446 mg/L. The baseline total nitrogen average for sample site S-10 is 0.317 mg/L with a post-operation average of 0.453 mg/L. These values equate to an increase of approximately 0.1 mg/L post-operation vs pre-operation.

Examples of other water quality improvement activities conducted by the Town include developing and posting educational flyers about stormwater runoff; participating in local stormwater and watershed management events including educational workshops for residents and Town employees; strategically acquiring land for water quality protection; providing water quality information on the local cable access channel and in the local newspaper; developing a "Guide for the Design of Storm Drainage Facilities in the Town of Plymouth, Massachusetts"; stenciling storm drains to indicate their connection to Town waterways; collaborating with other organizations (*e.g.,* watershed associations and community groups) to promote water quality improvement and protection initiatives; implementing a street sweeping program; conducting catch basin cleaning; offering a zero-interest loan for septic system upgrades; and participating in cleanup events.

4.3 Coastal and Barrier Beaches

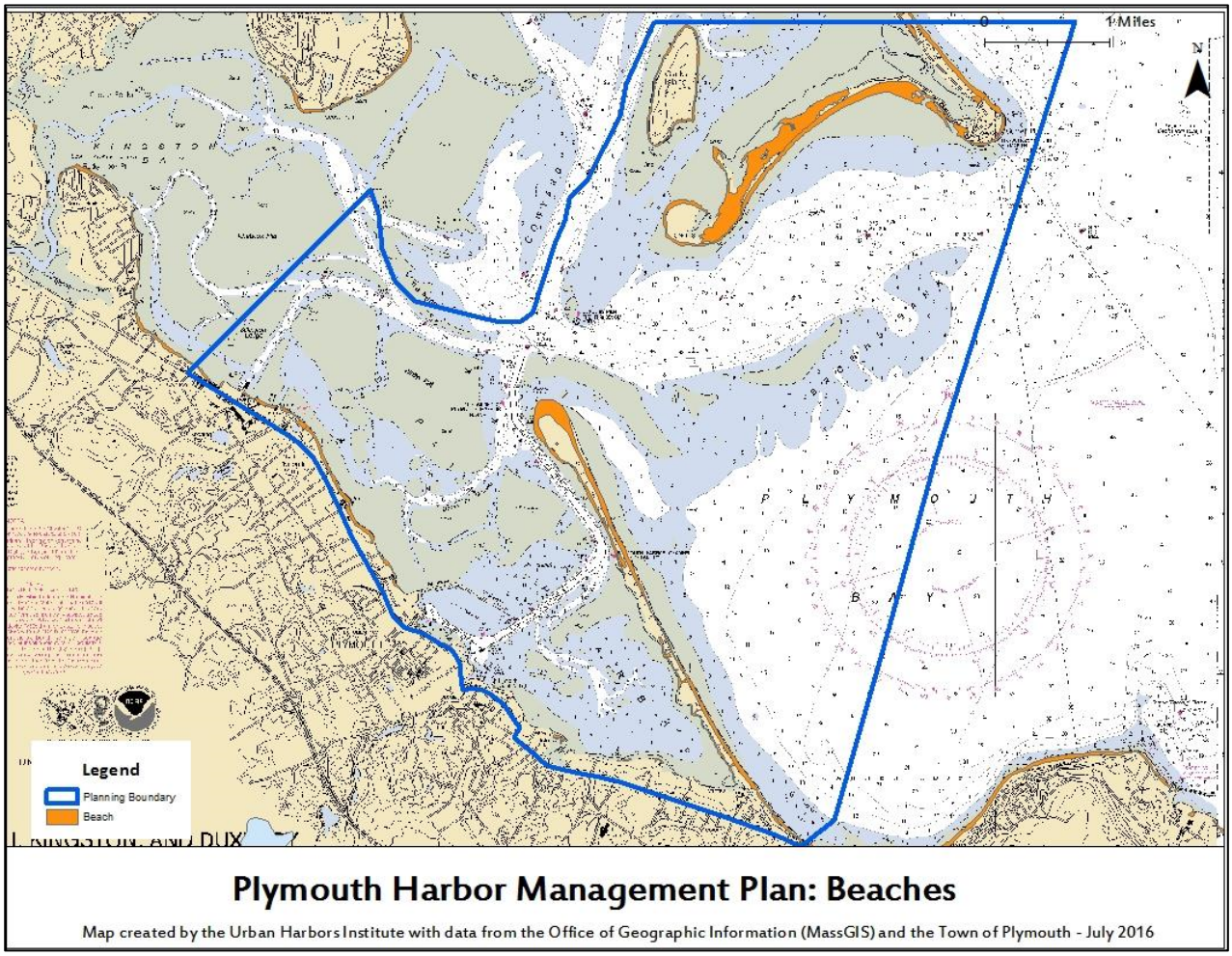
Beaches in Plymouth provide flood protection, help to dissipate wave action, provide and protect coastal habitat, serve recreational needs, and contribute to the coastal economy and character of the Town. Several beaches exist within the Harbor Planning Boundary, offering a range of services, as described below.

Located in the northern portion of the planning area, Saquish, once an island, is now connected to the mainland by Saquish Neck and Duxbury Beach. Largely privately owned, access is typically restricted to property owners.

Access is also restricted on the privately-owned Clark's Island, located adjacent to the tip of the Saquish. The only island in Plymouth Bay, the island's beaches help to protect upland areas against storm damage and provide recreational opportunities for land owners.

A sandy coastal beach lines much of the shoreline extending from just north of the breakwater north into Kingston, with some rip rap protecting coastal properties, and seawalls extending along much of the shoreline at Cordage Park. The beach at Nelson Memorial Park is a popular recreational site during the summer months. Smaller stretches of sandy coastal beach occur south of downtown – most noticeably adjacent to the Plymouth Yacht Club, at Stephen's Field, and at Poverty Point.

The largest beach in the planning area, Plymouth's Long Beach is a dynamic barrier beach in the southern portion of the Harbor Planning Area. Almost three miles long, Long Beach is important habitat for shorebirds such as the piping plover and least tern. The beach grasses and dune plants help to stabilize sediment and build the dunes. Long Beach is a popular place for recreation, including activities such as camping, swimming, and birding, and a management plan is in effect in order to minimize the impacts of human use on the natural resource. Long Beach protects the Harbor from storm impacts, though the beach itself often experiences overwash during severe storms. As a result of the overwashes and related erosion, the Town has conducted several projects to minimize erosion, including the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Plymouth Harbor Management Plan: Beaches
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - July 2016

Figure 4: Beaches in the Planning Area

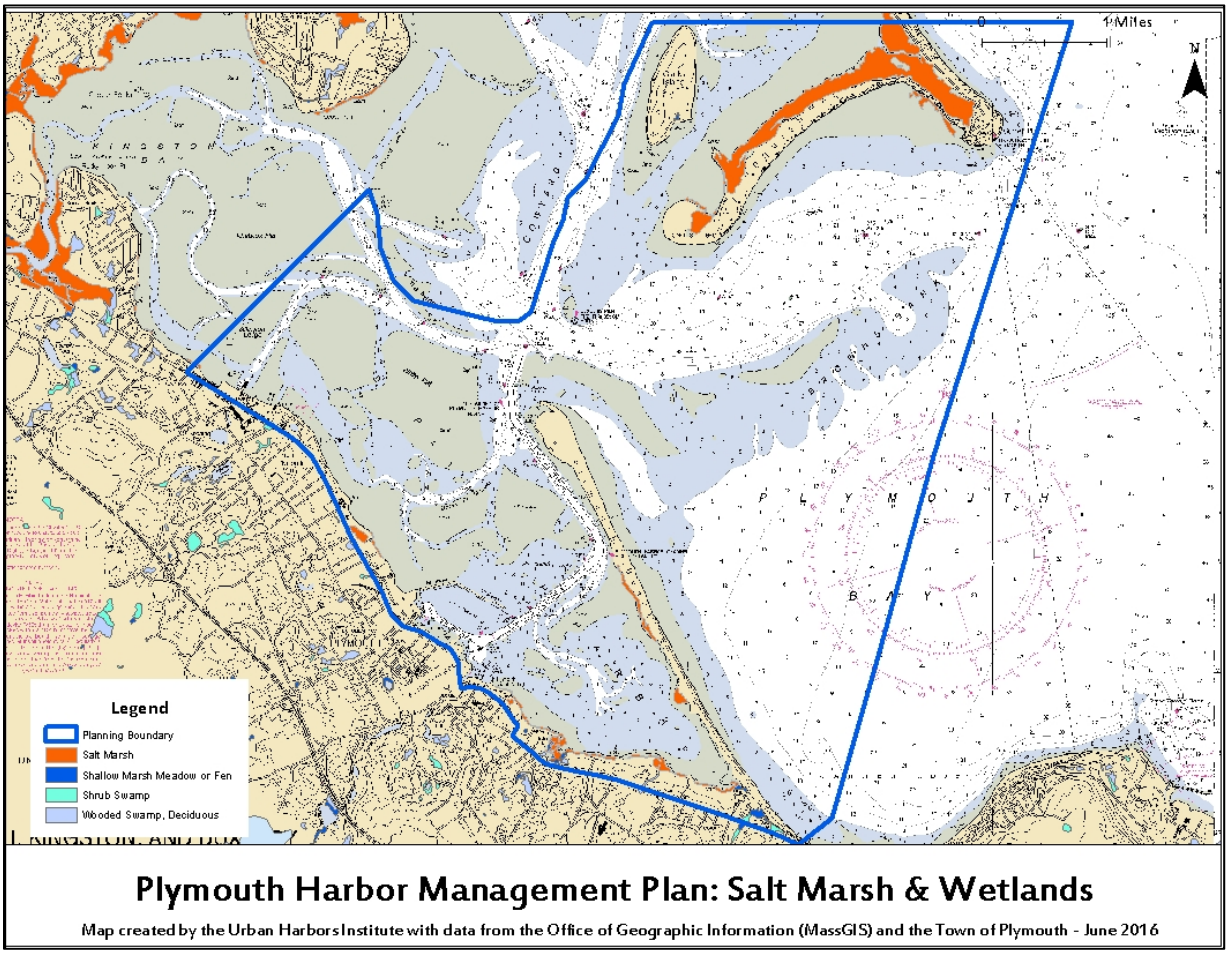
construction of stone groins and a seawall near the parking lots, and renourishment projects to address areas of overwash on the beach.[13]

Beaches are protected under the Town's Wetlands Protection bylaw (CH 196) and the state's wetlands Protection Act (M.G.L. CH 131 §40).

4.4 Salt Marshes

A salt marsh is a coastal wetland that "extends landward up to the highest high tide line…and is characterized by plants that are well adapted to or prefer living in, saline soils…. A salt marsh may contain tidal creeks, ditches and pools" (310 CMR 10.32.2). Salt marshes are critical spawning, nursery, and foraging habitats, providing shelter and food resources necessary to support many different species ranging from finfish to migrating birds. The network of roots and rhizomes underlying the marsh vegetation also binds sediment together, creating a layer of peat

[13] Massachusetts Office of Energy and Environmental Affairs. November 6, 2015.Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. Online at: http://209.80.128.250/EEA/emepa/mepacerts/2015/sc/enf/15422%20ENF%20Cobble%20Nourishment%20at%20Plymouth%20Long%20Beach.pdf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Salt Marsh
Shallow Marsh Meadow or Fen
Shrub Swamp
Wooded Swamp, Deciduous
Plymouth Harbor Management Plan: Salt Marsh & Wetlands
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - June 2016

Figure 5: Salt Marshes and Wetlands

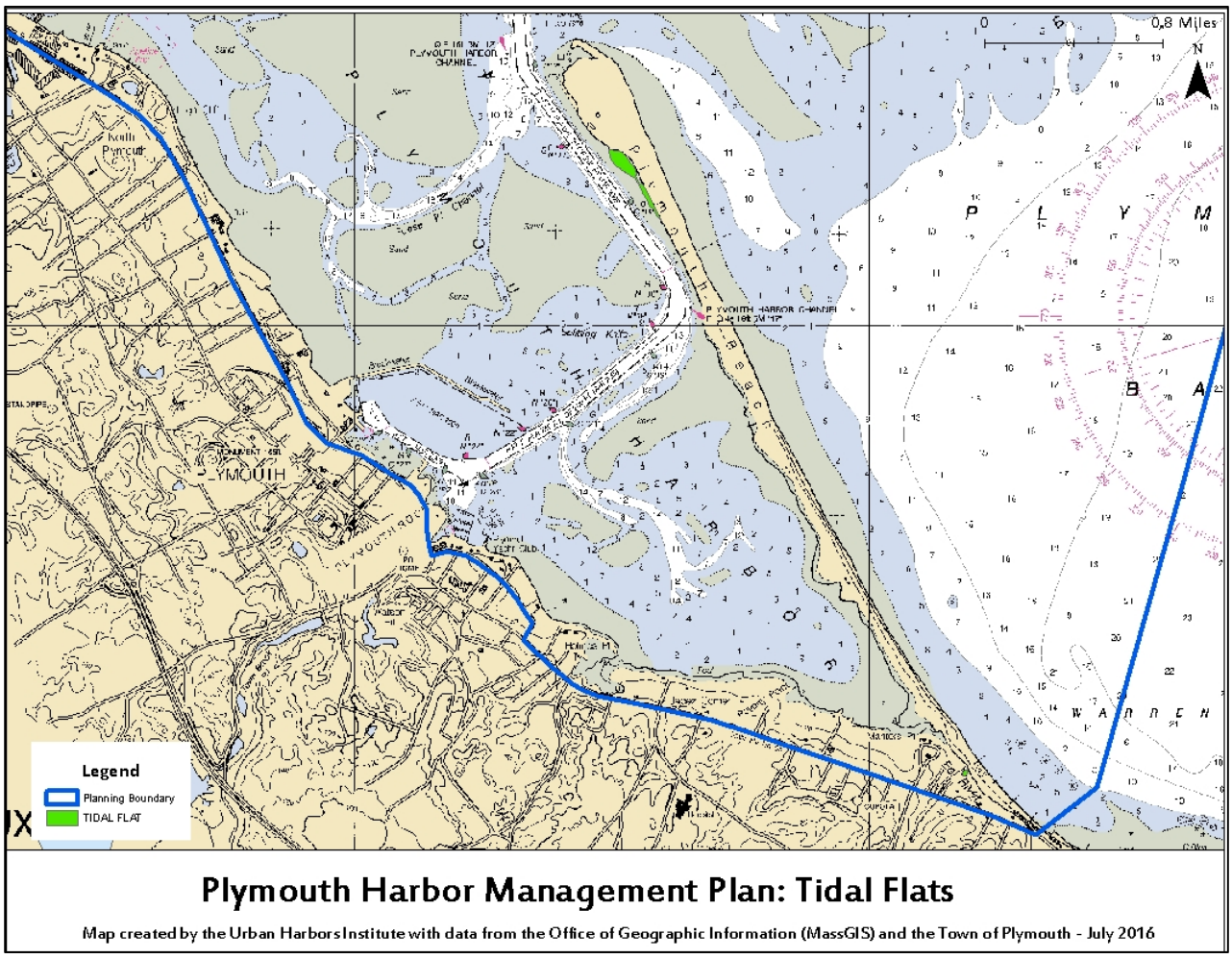
that can absorb floodwaters, prevent erosion, and remove pollutants from the water.

Salt marshes exist within in the Plymouth Harbor Planning Area, most noticeably on Saquish, but also the southeastern portion of the Harbor, along Long Beach, and in the area just south of Bay View Avenue, as shown in Figure 4. Together, the salt marsh areas within the planning boundary cover approximately 200 square acres.

Saltmarshes and other wetlands in Plymouth are protected under the Town's Wetlands Protection bylaw (CH 196) and the state's wetlands Protection Act (M.G.L. CH 131 §40).

4.5 Tidal Flats

Areas of unconsolidated sand and mud that are exposed at low tide and submerged at high tide, tidal flats support a high degree of biodiversity and play an important role in nutrient recycling. Within the Harbor Planning Boundary are approximately 3.7 acres of tidal flats, located off the west side of Long Beach. Though not extensive, these flats are important habitat for shorebirds and shellfish. Tidal flats are protected under the Town's Wetlands Protection bylaw (CH 196) and the state's wetlands Protection Act (M.G.L. CH 131 §40).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TIDAL FLAT
Plymouth Harbor Management Plan: Tidal Flats
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - July 2016

Figure 6: Tidal Flats in the Plymouth Harbor Planning Area

4.6 Harbor Wildlife

Many areas within the Harbor serve as habitat for fish, shellfish, birds, marine mammals, and other types of wildlife.

Long Beach is an important habitat for shorebirds, including migrating birds and summer nesting populations of Common Tern (a state-designated species of special concern), Arctic Tern (a state-designated species of special concern), Roseate Tern (a state and federally-designated endangered species), and Least Tern (a state-designated species of special concern), as well as Piping Plovers (a state and federally-designated threatened species) and laughing gulls. In fact, all waters within the Planning Boundary, as well as all of Long Beach, are listed as "Priority Habitats of Rare Species" by the state's Natural Heritage and Endangered Species Program (NHESP), meaning that the area meets known habitat requirements for state-listed rare species or that state-listed rare species have been documented or their movements have been reported in this area.

Piping plover and least tern communities, in particular, have been well-documented on Long Beach. "Between 1984 and 2015, the population of breeding piping plovers at Plymouth Long Beach ranged from a low of 1 pair (1991) to a high of 24 pairs (2009)…The average number of breeding pairs over the last 5 years between

2011 and 2015 was 18.7 pairs (range 15.5 to 3)."[14] "Records dating back to 1977 show that the population of least terns at Plymouth Long Beach has varied widely with a low of 3 pairs in 1981 to a high of 512 pairs in 2008…. Over the last five years, the number of breeding pairs of least terns has ranged from 20 to 225. Productivity has also varied widely as a result of factors including predation and weather."[15]

In addition to supporting bird nesting and migration activities, monitoring in 2007 – at Long Beach, Saquish Cove, and Stephen's Field – indicated that the Harbor is an important site for horseshoe crab spawning, and serves as a horseshoe crab nursery.[16]

The significance of Plymouth Harbor as an important habitat for fish is evident when considering that National Oceanic and Atmospheric Administration has listed Plymouth Harbor as Essential Fish Habitat (EFH) for at least 27 species during various stages of life (*e.g.,* eggs, larvae, juvenile, and/or adult).[17] The species include:

- Haddock
- Ocean Pout
- Pollock
- Yellowtail Flounder
- Sea Scallop
- Window Pane Flounder
- Atlantic Cod
- White Hake
- Winter Flounder
- Red Hake
- Silver Hake
- Bluefin Tuna
- White Shark
- Smooth Dogfish
- Northern Shortfin Squid
- Longfin Inshore Squid
- Atlantic Mackerel
- Atlantic Halibut
- Atlantic Herring
- Atlantic Wolffish
- Spiny Dogfish
- Winter Skate
- Little Skate
- Scup
- Atlantic Butterfish
- Bluefish

The Town has taken steps to ensure that it maintains conditions necessary to support local fish populations, including restoration projects at Eel River and Town Brook, which have improved conditions for important anadromous fish such as herring.

Shellfish are also abundant in Plymouth Harbor. The Massachusetts Division of Marine Fisheries, along with partners, has identified portions of the planning area as habitat or potential habitat for bay scallops, blue mussels, European oysters, ocean quahogs, quahogs, razor clams, sea scallops, soft-shell clams, and surf clams.[18] Areas believed to be habitat or potential habitat for specific species are shown in Figure 7. The abundance of fish, along with the presence of haul-out sites, also attract harbor seals and gray seals, the latter of which have been increasing in numbers during the last several years, attracting white sharks to areas such as Long Beach.

[14] Town of Plymouth Department of Marine and Environmental Affairs. 2016. Massachusetts Habitat Conservation Plan for Piping Plover Request for Certificate of Inclusion.
[15] *Ibid.*
[16] MA Division of Marine Fisheries. 2012. Massachusetts 2012 Compliance Report to the Atlantic States Marine Fisheries Commission – Horseshoe Crab.
[17] NOAA Habitat Mapper. Data queried August 2016.
[18] MA Division of Marine Fisheries. 2011. MassGIS Data – Shellfish Suitability Areas.

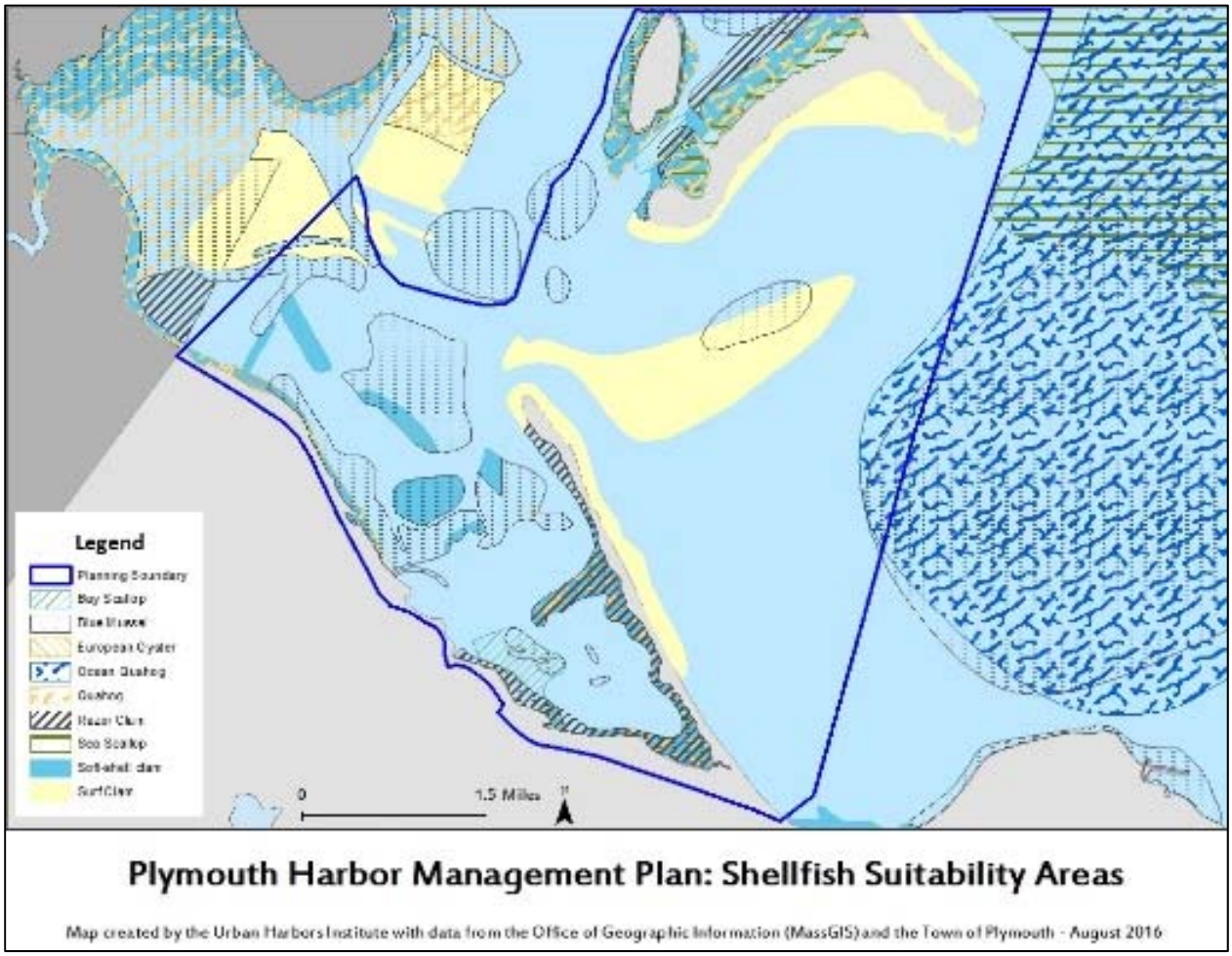


Figure 7: Shellfish Suitability Areas

4.7 Diadromous Fish Passages

Three diadromous fish passages, Eel River Town Brook, and Wellingsley Brook, are located within the Harbor Planning Area (see Figure 9). Starting in the late 1700s, six dams were constructed along Town Brook, creating barriers for the river herring and rainbow smelt that migrated in the river. In 2002, in an effort to improve fish passage, the Billington Street Dam was removed. Subsequently, the Water Street Dam was lowered 12 inches to enhance fish passage, fish ladders were improved at the Jenny Grist Mill and the Newfield Street Dam; a culverted portion of the river was restored; the Off Billington Street Dam was removed; and the Plymco Dam was removed.[19] Together, these efforts have significantly improved fish passage along Town Brook, which supported an estimated spring population of approximately 173,567 herring in 2015.[20] This estimate is the second highest estimate in the last eight years,

[19] National Oceanic and Atmospheric Administration. NOAA's Work on Town Brook in Plymouth, MA. Online at: https://www.greateratlantic.fisheries.noaa.gov/mediacenter/2014/noaatownbrook.pdf.

[20] Town of Plymouth, MA. 2015. Town Brook Herring Information. Online at: http://www.plymouth-ma.gov/marine-and-environmental-affairs/pages/town-brook-herring-information. Last visited 6/8/2016.

as shown in Figure 8.[21] The last dam impeding fish passage on Town Brook is Holmes Dam, which is slated to be removed in 2018.

On Eel River, the Sawmill Pond Dam was removed and a cranberry bog was restored to wetlands, which involved the removal and replacement of two under-sized culverts, removal of a culvert, and removal of seven small water control structures.

On Wellingsley Brook, three weirs were removed, and pools and riffels were created to restore habitat for salter brook trout.

Restored Town Brook in 2005, after the removal of Billington Street Dam22

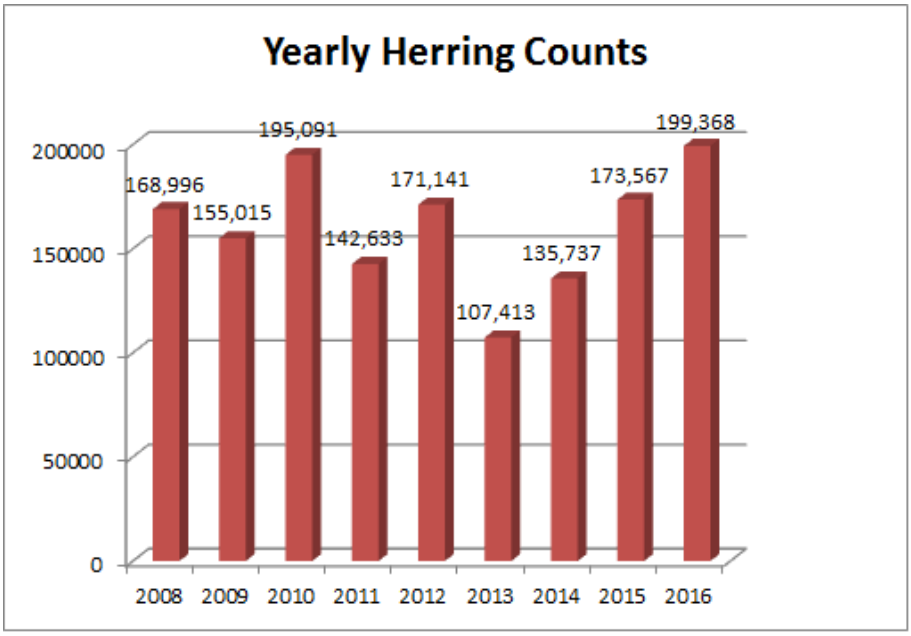


Figure 8: Yearly Herring Counts (Town of Plymouth)

[21] *Ibid.*

[22]NOAA Fisheries greater Atlantic Region. Celebrating Herring at Historic Town Brook, Plymouth MA. Online at: https://www.greateratlantic.fisheries.noaa.gov/stories/2015/april/pp.html

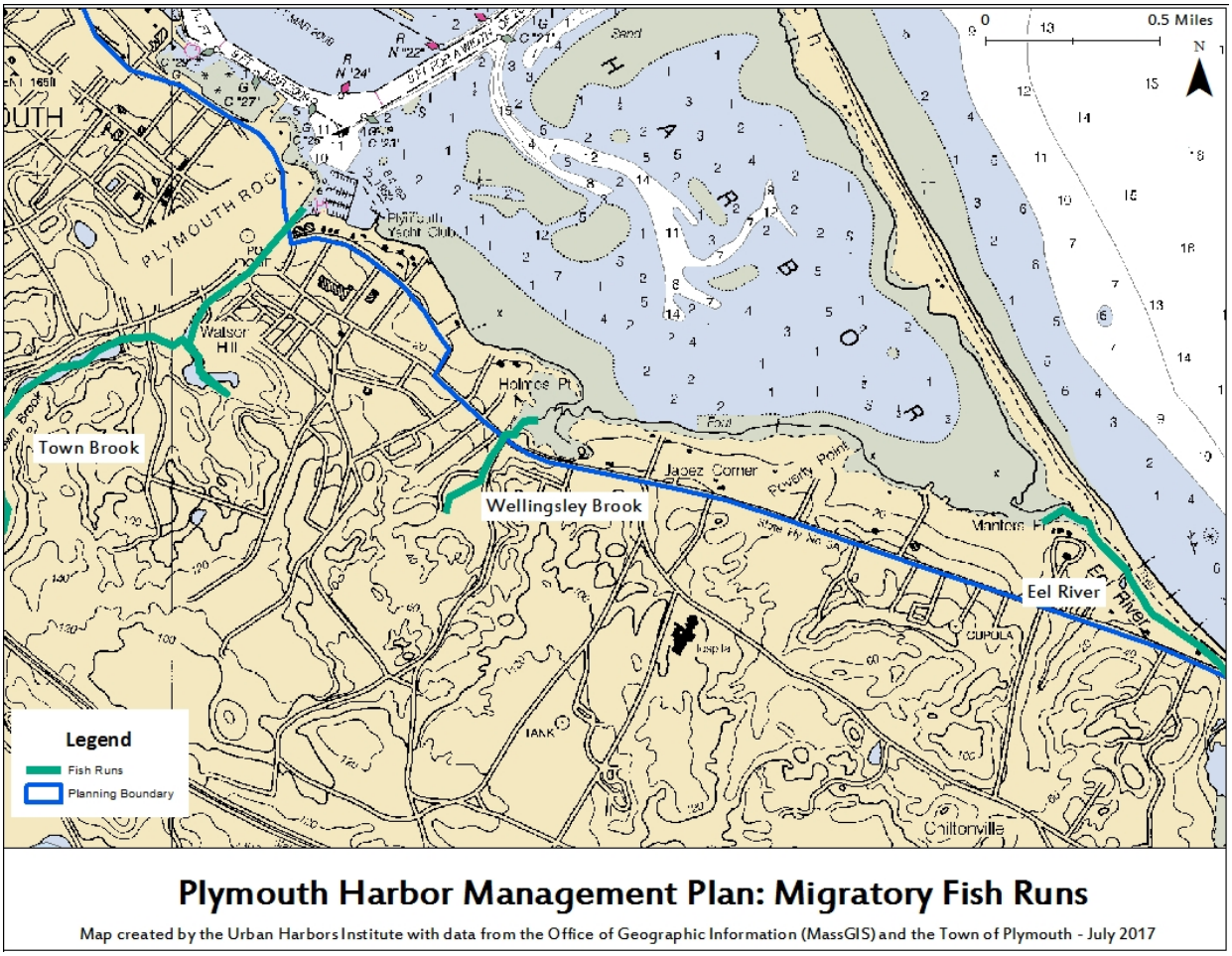

0
0.5 Miles
N
Town Brook
Wellingsley Brook
Eel River
Legend
Fish Runs
Planning Boundary
Plymouth Harbor Management Plan: Migratory Fish Runs
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - July 2017

Figure 9: Migratory Fish Runs

4.8 Eelgrass

Eelgrass (*Zostera marina* L.), a submerged plant, is found in multiple areas of Plymouth Harbor. This important plant provides many services including trapping sediment, filtering runoff, absorbing nutrients, dissipating wave energy, creating habitat for juvenile fish, serving as spawning ground for adult fish, and providing food for various organisms.

Sensitive to many stressors including disease, predation, changes in water temperature, turbidity and light limitation, excessive nitrogen, sediment dynamics, and physical damage from ice, boating activities, and dredging, eelgrass is declining both globally and locally. A recent study of the Plymouth, Duxbury, Kingston embayment, conducted by the Massachusetts Division of Marine Fisheries, found a roughly 71% decline in eelgrass coverage between 1951-2014, with a very rapid period of decline between 2012 and 2014.[23] The pattern of decline is characterized by dense beds gradually thinning and ultimately disappearing.

While the study did not identify the exact causes of eelgrass loss, researchers noted that, "the loss is likely caused primarily by degrading environmental conditions due to water quality impairments from runoff and wastewater, the effects of which are exacerbated by temperature increase."[24] Researchers also identified several recommendations to prevent additional loss and to promote restoration. Given the recent dramatic decline in eelgrass and the significance

[23] Massachusetts Division of Marine Fisheries. 2016. Eelgrass Loss over Time in Duxbury, Kingston, and Plymouth Bays, Massachusetts.

[24] *Ibid.*

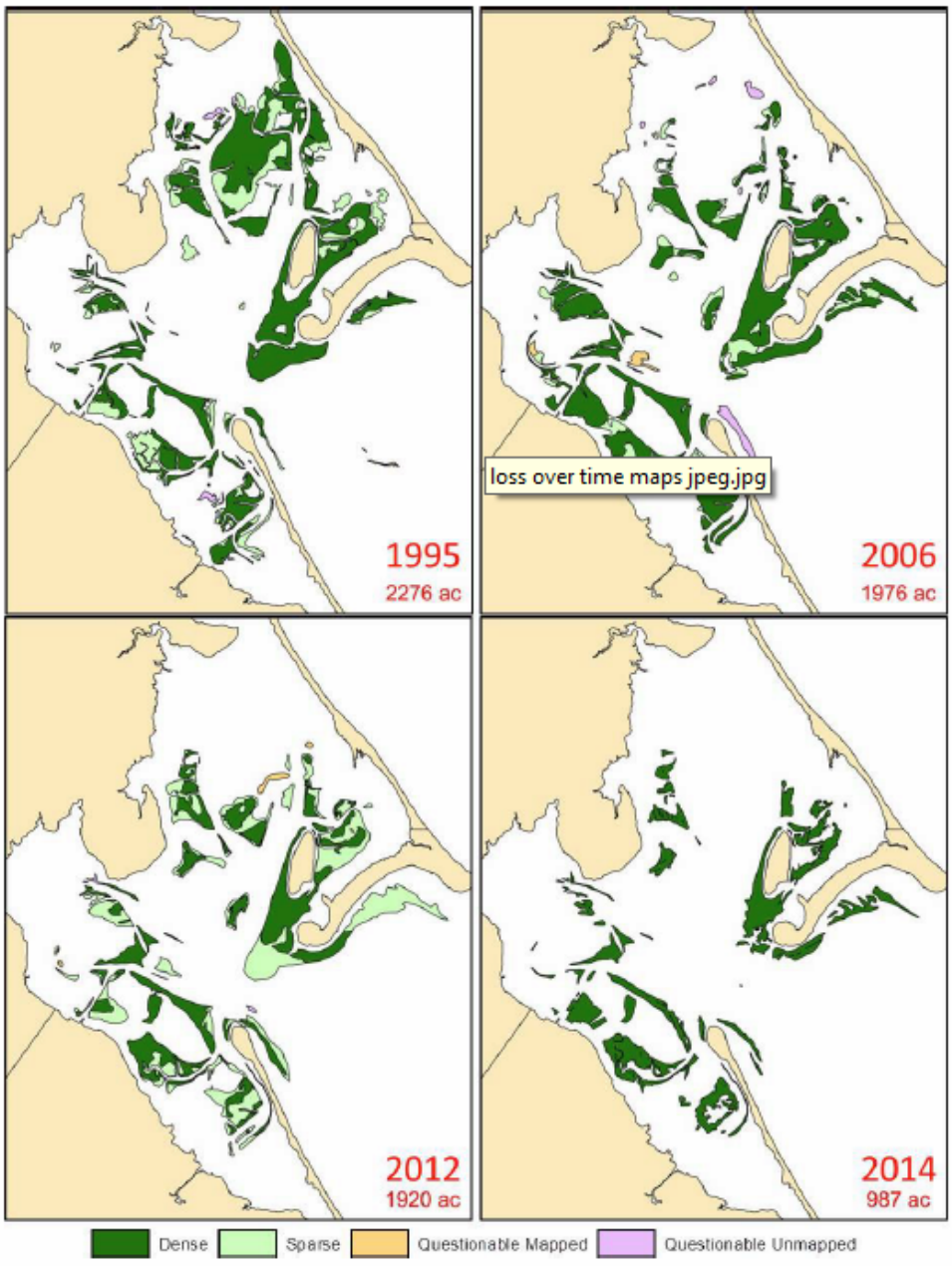


Figure 10: DMF-Mapped Eelgrass Loss between 1995-2014.
(Maps taken from Massachusetts Division of Marine Fisheries. 2016. Eelgrass Loss over Time in Duxbury, Kingston, and Plymouth Bays, Massachusetts.)

it has in the local ecosystem, many of those recommendations have been incorporated into this plan.

4.9 Aquaculture

The Town has taken important steps to encourage shellfish aquaculture in the Harbor. In 2011, the Town developed its first aquaculture bylaws and licensing process. More than two dozen people expressed interest, but obtaining a

license proved cumbersome. Applicants seeking ten acres or less first needed approval from the Board of Selectmen and then needed approval from the Massachusetts Division of Marine Fisheries and the US Army Corps of Engineers. In four years, the Town issued a total of nine licenses.[25]

Recognizing the lengthy process to obtain an individual license, in 2014 the Town set up an Aquaculture Development Zone. Working with the Division of Marine Fisheries, the Town officially approved a large section of tidelands for aquaculture – resulting in a streamlined permitting process for growers. The Aquaculture Development Zone, located in the western portion of the Harbor Planning Area (see Figure 11), is divided into 27 grant sites and licenses have been issued for all sites. An additional seven growing sites will produce oysters, quahogs, and scallops. Growers are in various stages of production, with some only recently placing gear and seed in the water; therefore, total landing numbers are still low. In 2015 however, the few farms already in production yielded roughly 150,000-160,000 harvested animals each, showing that this industry has great potential.

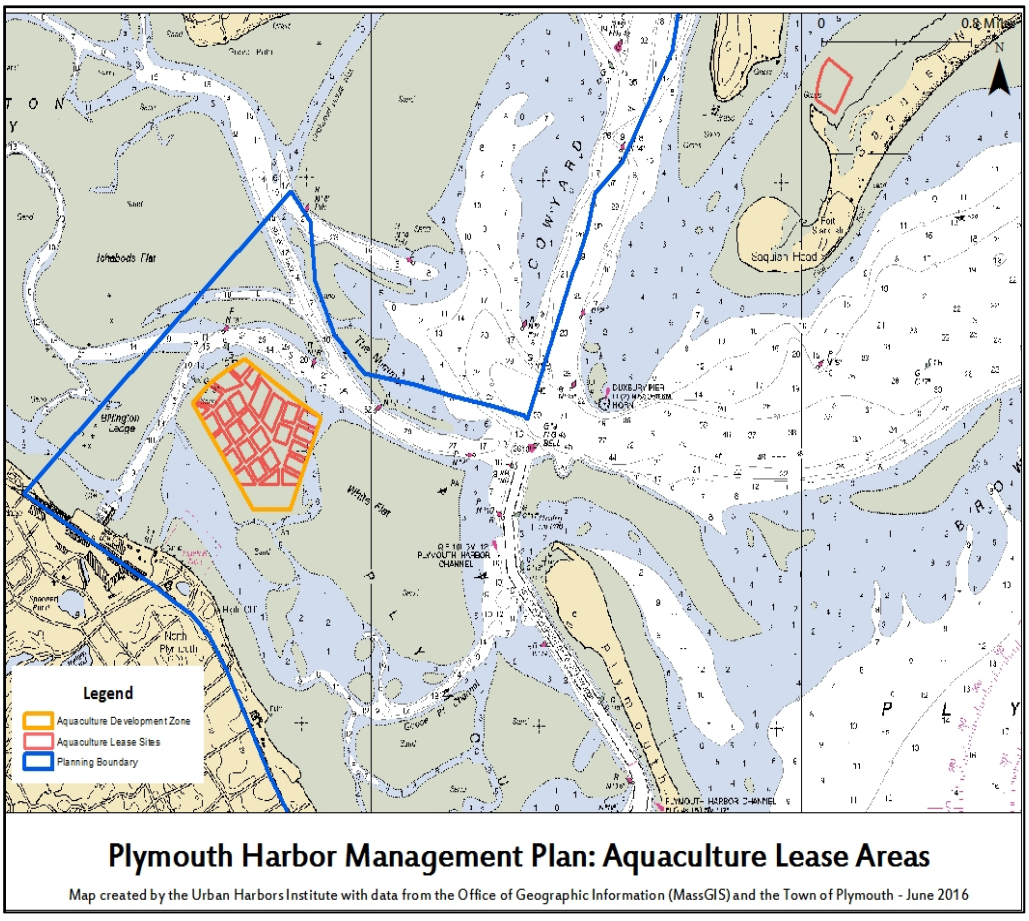

Legend
Aquaculture Development Zone
Aquaculture Lease Sites
Planning Boundary
Plymouth Harbor Management Plan: Aquaculture Lease Areas
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - June 2016

Figure 11: Aquaculture Leases in Plymouth Harbor

[25] M and, F. January 19, 2015. Aquaculture Development Zone: Aspiring shellfish farmers slowed by regulatory concerns. Old Colony Memorial.

4.10 Commercial and Recreational Fishing

In addition to the aquaculture activities described above, the Harbor supports recreational as well as commercial fishing.

Commercial Fishing

Over the last 16 years, the number of permitted fishermen with addresses in Plymouth has ranged from a low of 150 fishermen in 2008 to a high of 185 fishermen in 2002, as shown in Table 1. The number of dealers with addresses in Plymouth has increased significantly from 18 dealers in 2000 to 28 dealers in 2015.

While fishermen target a variety of species including Atlantic cod, winter flounder, and bluefin tuna, the American lobster fishery is the largest fishery in Plymouth. Despite the slow decline in the number of endorsements held by Plymouth fishermen (see Appendix B), they collectively landed 1,060,595 pounds of American lobster in 2015, bringing in $4,768,213.73.

To further demonstrate the importance of the local lobster fishery to the Town's economy, over the last 16 years, the total dollar value of lobster landed in Plymouth was $34,401,873. During that same period of time, the annual values ranged from a low of $2,356,869 in 2009 to a high of 4,768,213.73 in 2015.

Fishing for dogfish, while not as widespread or as lucrative as American lobster, is becoming more common in Plymouth Harbor. Endorsements for dogfish are on an upward trend, increasing from 9 in 2000 to 36 in 2015. This increase may be due to the declining groundfish fishery and the abundant local supply of dogfish. While low demand for the product is keeping prices down, efforts are underway to increase demand for dogfish locally and abroad, and it is possible that the number of local endorsements will continue to increase.

Endorsements for striped bass have also increased, more than doubling in the past 16 years, from 42 in 2000 to 95 in 2015.

Shellfishing

Plymouth Harbor also supports a vibrant recreational shellfishery. As far back as the 1970s, shellfishing had been prohibited in Plymouth's entire inner harbor due to poor water quality. Over-digging and limited populations of soft-shell clams, little necks, and quahogs in the open areas outside the inner harbor meant that most recent shellfishing activity focused instead on the harvest of surf clams and razor clams. In the fall of 2014, however, the Town received approval from the Massachusetts Division of Marine Fisheries to open shellfishing flats along the western edge of Long Beach. The opening was the result of recent water quality improvements such as the No Discharge Zone Designation for the Harbor, stormwater management efforts, and the construction of the Town's wastewater treatment facility. Today, the area along Long Beach is a popular destination for harvesting littlenecks and cherrystones. The Town is also seeding the area with quahogs to supplement the natural populations.

To shellfish in Town waters, a person over the age of 14 must obtain a permit and have that permit with him/her while shellfishing.

The Town's shellfish regulations limit the allowable harvesting gear to conventional tined tools, prohibiting the use of shovels and hand or motor-powered digging tools. Additional rules are in place to establish limits and harvesting days, as detailed in Table 2.

Table 1: Numbers of Fishermen and Dealer Permits for Plymouth Residents

# Permits for Plymouth Residents, 2000-2015[1]		
Year	Commercial Fishermen	Dealers
2000	174	18
2001	167	15
2002	185	14
2003	183	15
2004	175	16
2005	166	20
2006	164	18
2007	154	21
2008	150	20
2009	161	26
2010	156	27
2011	158	28
2012	150	25
2013	169	26
2014	159	28
2015	162	28

Table 2: Town Shellfish Regulations

Species	**Limit**	**Harvesting Days**	**Harvesting season**	**Size limits**
Sea clam	24 clams/day	7 days a week	Throughout the year	--
Soft shell clam	6 quarts/week	Wednesday and Saturday	April, May, September, October	At least 2 inches in greatest length
Quahog	6 quarts/week	Wednesday and Saturday	April, May, September, October	At least 2 inches in greatest length
Razor clam	6 quarts/week	Wednesday and Saturday	April, May, September, October	--
Mussels	6 quarts/week	Wednesday and Saturday	April, May, September, October	--

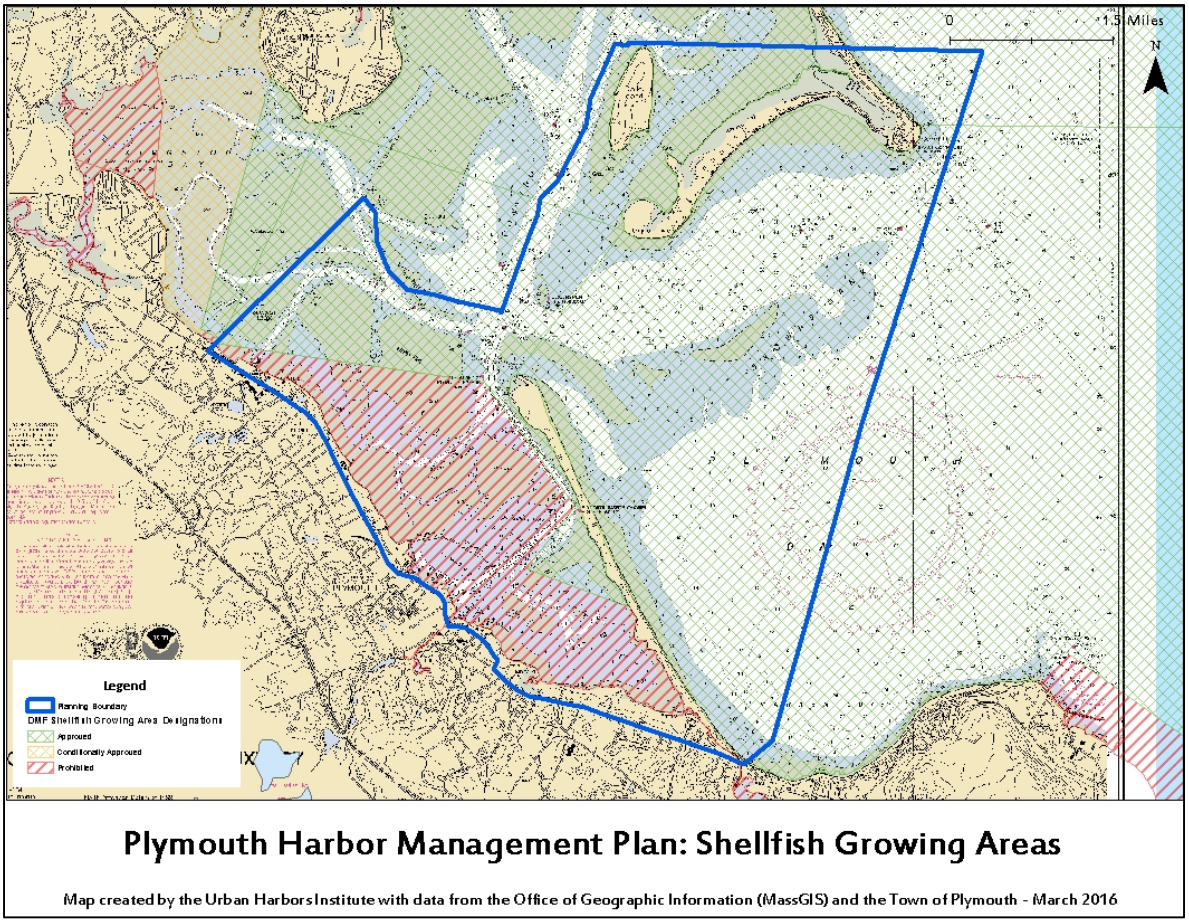

0
1.5 Miles
N
Legend
Planning Boundary
DMF Shellfish Growing Area Designations
Approved
Conditionally Approved
Prohibited
Plymouth Harbor Management Plan: Shellfish Growing Areas
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - March 2016

Figure 12: Shellfish Growing Areas

4.11 Recreational and Transient Boating

Plymouth Harbor, a well-sheltered harbor of safe refuge for boaters, is also the last port (heading south) and first port (heading north) when transiting the Cape Cod Canal. Its location along the coast, combined with its rich cultural resources and proximity to downtown Plymouth make the Harbor an important local boating resource as well as an attractive transient boater destination.

A 2012 survey of recreational boaters from Northeastern Massachusetts showed that most (83%) boaters using Plymouth Harbor were on vessels registered in Massachusetts. The study did not track in-state transient data to determine what portion of the 83% were from Plymouth and what portion were from other towns in the state, but town data from the 2016 boating season shows active transient use, with approximately 170 transient stays in Plymouth Harbor that season.

As a transient boating destination, Plymouth offers out-of-town visitors a water-based means of exploring the town's rich history and the nearby downtown. The harbor is also an international port of entry, reducing the need for boaters to visit larger cities such as Boston and New Bedford in order to register with Customs.

A source of municipal revenue, in 2015, the harbor's moorings brought in $130,000 in permit fees and $8,000 in rental fees for the Town alone (*i.e.,* not including profits associated with mooring and slip fees at private facilities). Additionally, boats registered in

Plymouth contributed aproximately $23,000 to the local economy in 2015 in the form of boat excise taxes. While some of the revenue was from commercial vessels, recreational users make up the majority of boats registered in Town.

According to the 2014 Massachusetts Boat Registration database and the 2014 United States Coast Guard documented vessel database, boaters registered 2,632 recreational ("pleasure") boats with Plymouth as the storage town.

The Town maintains 10 dedicated transient moorings which are rented at $35/night. The Yacht Club and Brewers Marina also accommodate transient boaters. For day visits, transient boaters may be placed on a seasonal mooring, at no cost to them, when the permitted vessel is known to be away.

4.12 Harbor Facilities

Extensive boating-related facilities and infrastructure exist in Plymouth Harbor, including four mooring fields, two private marinas, a state pier, two Town docks, two boat yards, and a yacht club (see Figure 13). Together, these facilities offer roughly 600 moorings and 170 slips, as shown in Table 3. The popularity of boating is reflected in the fact that, despite the extensive mooring fields, the waitlist for a Town mooring consists of 337 applicants (as of August 1, 2016) – a dozen of whom have been on the wait list for ten years or more. Waits at private facilities are also substantial.

Harbor infrastructure also includes three public boat ramps, a pump-out boat, four shore-side pump-outs, and three sites for fuel and water. These facilities, located in the sheltered waters of Plymouth Harbor, provide important services and cultural and recreational opportunities as described in greater detail throughout this section; and given the importance of these facilities, routine maintenance is essential.

In addition to recreational boating activity, the Harbor also supports:

- Charter boats ranging in size from 30 to 110 feet, engaging in sport fishing, whale watching, and sight-seeing tours
- Commercial fishing vessels, the majority of which are lobstering vessels kept at moorings in the Harbor
- A fast ferry from Plymouth to Provincetown, which runs from June through September

Piers/Wharves

The State Pier, owned by the Massachusetts Department of Conservation and Recreation, is home to the *Mayflower II*, Plimouth Plantation's full-scale reproduction of the original *Mayflower*, and the Plymouth to Provincetown fast ferry. The wooden pier is approximately 1/3 acre in size. With 10 feet of depth at mean low water, the State Pier can accommodate small cruise ships up to 200 feet in length. The state pier also includes a gangway to dinghy docks, allowing for accessibility by those travelling via water. A recent assessment of state piers found that the pier, while generally in good condition, needs "1) replacement of the dolphin clusters that support the *Mayflower II,* 2) dredging to increase the water depth, and 3) improvements for ADA compliance."[26]

The Town Pier and T-Wharf are largely for commercial users, including fishermen and whale watch vessels, though water and fuel at the Town Pier are available for all harbor users, making the Pier very congested during peak boating times. The Town is in the process of completing a $3.25 million dollar project funded by MassWorks and the Town of Plymouth, to reconstruct the T -Wharf, which had fallen into disrepair and was only partially functional. These

[26] Karl F. Seidman Consulting Services and Urban Focus LLC. 2016. Massachusetts State Piers: A Business and Operations Assessment.

renovations will alleviate some of the congestions at the Town Pier and provide additional berthing for commercial users.

Ramps

In addition to the reconstruction of the T-Wharf, the state's Office of Fishing and Boating Access recently completed repairs to the Leo Demarsh State Boat Ramp. Managed by the Harbormaster, the ramp is the second busiest launch ramp in the state, with two launch lanes and more than 100 parking spaces available. In addition to normal ramp activity during the peak boating season, the ramp is critical for launching and removing vessels at the beginning and end of the boating season and is an important site for boat removal in preparation for large storms. Following T-Wharf reconstruction, dredging will further enhance conditions around the state ramp, and additional boating-related amenities (*e.g.,* restrooms, laundry) will be added in the vicinity of the renovated ramp as part of the construction of a maritime facility that will also house a new harbormaster office.

Adjacent to the state ramp, the old Town ramp is usable but is (1) tidally dependent, (2) near an overhead wire, limiting the height of boats that can be safely launched, and (3) in need of a variety of improvements to make it accessible for larger boats. The Town ramp will likely be renovated in the coming years.

Additional launching is available at Nelson Memorial Park and at Stephen's Field. Both of these launch sites are shallow and informal and best suited for small boats, kayaks, canoes, and paddleboards. Launch improvements may be made as part of forthcoming rennovations to Stephen's Field.

Vessel Storage and Repair Facilities

The Pier at Cordage, located in the northern part of the Harbor Planning Area, is a 54-slip marina that can accommodate vessels up to 66 feet in length. Dredging would provide expansion opportunities at this site, but obtaining the necessary permits make dredging unlikely in the near future. A small number of local fishermen dock at this facility, and secure on-land storage is also available.

Plymouth Boat Yard is a repair and storage facility north of the downtown harbor area. The facility has been in operation for more than 70 years and services a variety of recreational and commercial vessels.

Brewers Marine is a 100-slip marina with 500 feet of face dock to accommodate large vessels (up to 150 feet). The facility includes a 35-ton travel lift and stores approximately 200 boats over the winter. Transient boating is very popular at Brewers, with approximately 1,000 transient boats visiting, on average, each summer.

The Plymouth Yacht Club has been in operation since 1890 and provides sailing lessons and organizes races in Plymouth Harbor. The Yacht Club manages ten moorings in the Harbor and has a launch service as well.

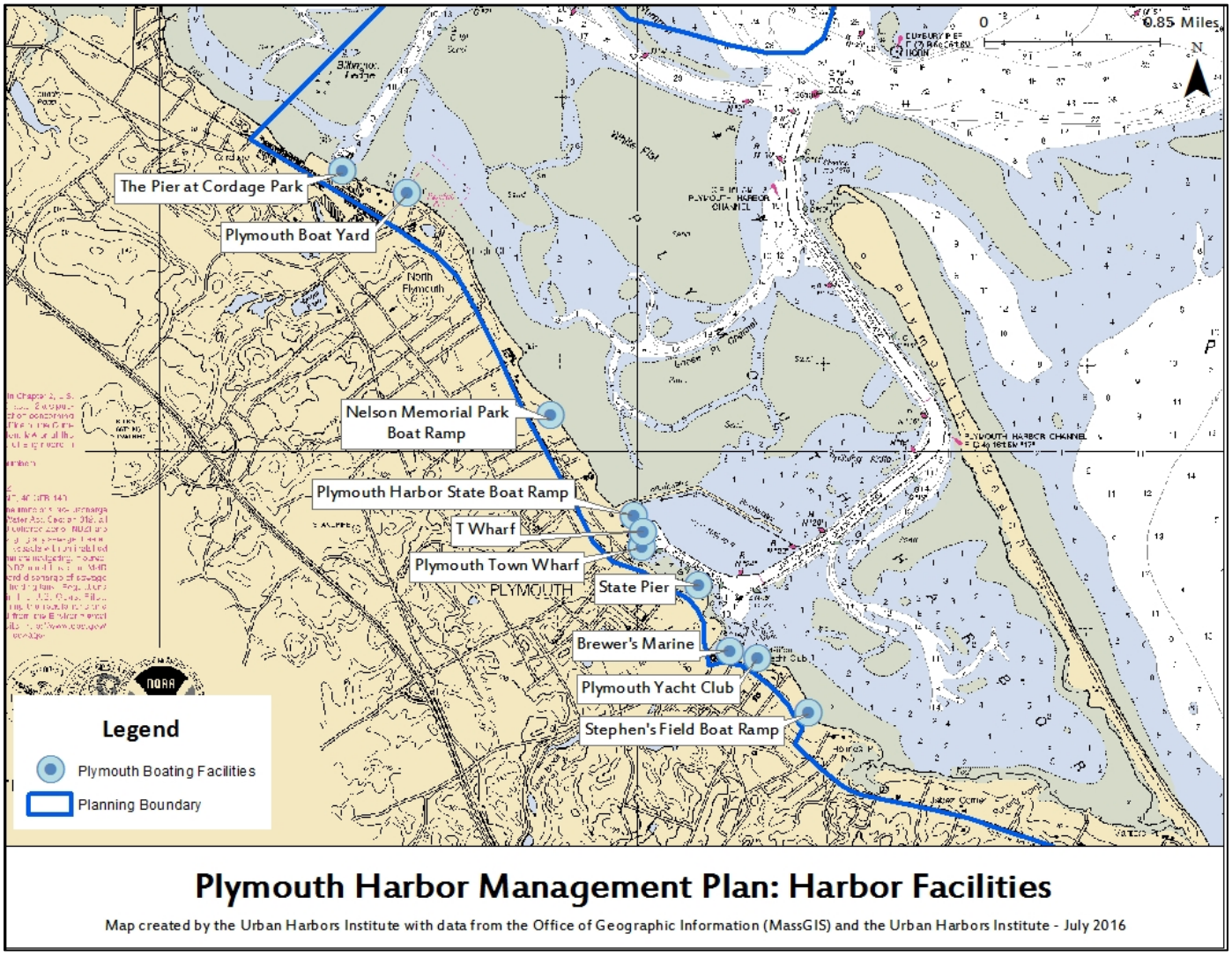


Figure 13: Boating Facilities Located within Plymouth Harbor

Table 3: Harbor Facilities and Amenities (Mooring field numbers are estimates of current conditions)

Facility Name	Public / Private	# Slips	# Moorings	# Launch Lanes	Pumpout	Fuel	Transient Accommodations	Upland Storage	Water	Electricity (amps)	Ice	Services
Mooring Field - West of Entrance Channel	Public	0	40	0	Y	Both gas and diesel	n/a	n/a	n/a	n/a	n/a	
Mooring Field - Southeast of Federal Channel	Public	0	80	0	Y	None	n/a	n/a	n/a	n/a	n/a	
Mooring Field - Federal Anchorage	Public	0	400	0	Y	None	7 moorings	n/a	n/a	n/a	n/a	
Mooring Field B (Plymouth Rock)	Public	0	50	0	Y	None	No	n/a	n/a	n/a	n/a	
Brewer's Marine	Private	100	0	0	Y	Both gas and diesel	Yes	Y	Y	>50amp	Y	Full service boat yard
Plymouth Boatyard	Private	0	0	1	N	None	No	Y	N	N	N	Full service boat yard
Plymouth Yacht Club	Private	0	10	1	N	None	Moorings	N	Y	N	Y	Launch service
Plymouth Town Wharf	Public	15	0	0	Y	Both gas and diesel	N	N	Y	N	Y	Cranes and pier access for commercial loading/unload-ing
Pier at Cordage	Private	45	0	1	Y	None	N	Y	Y	Y	n/a	Boat storage
State Boat Ramp	Public	0	0	2	N	None	n/a	n/a	n/a	n/a	n/a	n/a
Stephen's Field	Public	0	0	1	N	None	n/a	n/a	n/a	n/a	n/a	n/a
State Pier	Public	1	0	0	N	None	N	N	N	Y	N	Ferry/harbor tour/*Mayflower II*
T Wharf	Public	10	0	0	Y	Diesel	N	N	Y	50 amp	Deliv ery	Commercial pier for loading/unload-ing/ dockage

Channels, Anchorages, and Mooring Fields

Within the Harbor, an 18-foot deep channel, 200 feet wide and 2.5 miles long extends from Plymouth Bay for approximately one mile along the inside of Long Beach, and then continues west toward the state pier, ending in a turning basin. Another 150-foot wide, 15-foot deep channel extends approximately 0.3 miles north from the turning basin along the central waterfront, to Town Wharf. The access channel ends in another turning basin, 2 acres in size and 15 feet deep. Both of these channels are maintained by the Army Corps of Engineers, which also maintains the 3,500 foot stone breakwater that begins just north of Town Wharf. The Army Corps of Engineers also maintains the turning basin at the end of the 18-foot channel as well as an 8 foot deep 60-acre turning basin inside the breakwater.[27] These channels and anchorages are identified in Figure 14.

In addition to the mooring that occurs in the federal anchorage, the Town maintains three other mooring fields. Including the moorings at Plymouth Yacht Club, the mooring fields within the Harbor accommodate approximately 600 vessels. Boaters must obtain permission from the Harbormaster prior to placing, maintaining, and using a mooring. Boaters must fill out an application, and mooring permits are granted based on the order in which applications were received, as well as the specific requirements for each individual vessel.

The fields are not gridded, and mooring numbers are not geographically arranged, making it difficult for boaters unfamiliar with the Harbor to locate specific moorings.

Efforts to maintain safe conditions within mooring areas are separated into mooring tackle requirements for dredged and non-dredged areas.

Requirements for moorings in dredged areas include those identified in Table 4.[28]

[27] Army Corps of Engineers. Plymouth Harbor Navigation Project. Online at: http://www.nae.usace.army.mil/Missions/Civil-Works/Navigation/Massachusetts/Plymouth-Harbor/.

[28] Plymouth Town Code. §81-11

Table 4: Plymouth Mooring Tackle Requirements for Dredged Areas

Length of Boat (ft)	Cement Block or Equivalent (inches)	Chain Diameter (inches)	Pennant Diameter – Nylon or Equivalent (inches)
16 to 20	28 x 28 x 18	1/2	½
21 to 26	32 x 32 x 18	1/2	5/8
27 to 32	36 x 36 x 20	5/8	¾
33 to 38	36 x 36 x 24	5/8	7/8
39 to 42	42 x 42 x 24	3/4	1
43 to 55	48 x 48 x 24	7/8	1 ¼
56 and over	Subject to ruling by Harbormaster	Subject to ruling by Harbormaster	Subject to ruling by Harbormaster

The length of the pennant in dredged areas must be half the length of boat measured in a straight line from extreme bow chock to stern of boat. The length of the mooring chain for the flotation buoy is from the ocean floor to two feet above maximum high water. The diameter of hairpins or eyes in block anchors must be 25% heavier than chain specifications.

In non-dredged areas, mooring tackle requirements are as identified in Table 5.[29]

Within special mooring areas, which include moorings in channels, Hobs Hole, Saquish Head, Goose Point, Cordage Channel or equivalent tidal areas, existing moorings can stay at their existing overall scope, with the understanding that if harbor conditions in these areas become congested in the future, scopes will be shortened so that chain is two feet above mean high water and the pennant equals the length of the moored vessel.

Table 5: Plymouth Mooring Tackle Requirements for Non-Dredged Areas

Length of Boat (feet)	Cement Block or Equivalent (inches)	Chain Diameter (inches)	Pennant Diameter – Nylon or Equivalent (inches)	Scope (feet)
Under 16	36”x36”x12”	3/8 to 1/2	1/2	10
17 to 20	36”x36”x12”	1/2	1/2	10
21 to 26	36”x36”x12”	1/2	5/8	12

[29] Plymouth Town Code. §81-11

Winter spars must be installed on all moorings, regardless of whether they are in dredged areas or not, prior to September 1; and they must be removed by June 1.

The Harbormaster inspects all floatation cans, balls, and buoys annually and conducts additional mooring inspections regularly.

Additionally, the maximum speed within all mooring areas in Plymouth Harbor is headway speed.[30]

4.13 Harbor Safety and Navigation

The Town actively works to ensure that the Harbor is safe for its users. The Town's by-laws establish rules on harbor activities such as boating, swimming, and water-skiing, to minimize conflicts among users. The Harbormaster Department patrols the Harbor, enforcing regulations and providing assistance to boaters as appropriate. Aids to navigation and other signage, along with dredging, ensure that boaters avoid hazards and have adequate water depths to safely reach their destinations.

Dredging

Records of historical dredging activity indicate that the Army Corps of Engineers began dredging in Plymouth Harbor in 1876, with the creation of a 6-foot deep entrance channel to Town Wharf.[31] Since the creation of that entrance channel, several additional public (*i.e.,* municipal and federal) and private dredging projects have occurred in Plymouth Harbor, including the federal and private dredging of the Cordage Channel in the early 1900s.[32] The more recent projects are described in Table 6. These dredging projects were central to establishing the layout of boating activity within the Harbor, and each previously dredged site is in need of immediate dredging to maintain safe navigation and access.

In particular, both maintenance and improvement dredging are needed in the Harbor. Maintenance dredging is "dredging in accordance with a valid license or permit in any *previously authorized dredged area*, which does not extend the originally dredged depth, width or length"[33]. Improvement dredging, or "new dredging," can be more difficult to permit than maintenance dredging. Improvement dredging is *"*any dredging in an area *which has not been previously dredged* or which extends the original dredged width, depth, length or otherwise alters the original boundaries of a previously dredged area"[34]. Mooring fields and the channel in Plymouth require maintenance dredging to re-establish access to tidally-dependent areas. Furthermore, upon completion of the T-Wharf renovations, dredging will enhance access to the wharf, as well as to the state and Town ramps.

At the end of 2016, the Army Corps of Engineers proposed to dredge the Plymouth Harbor Federal Channel, turning basin, and anchorage, a project that would remove 340 cubic yards of sediment to be disposed at the Massachusetts Bay Disposal Site. As of the end of 2016, the Corps obtained the permitting and funding is needed to complete this project.

[30] Plymouth Town Code. §81-2.
[31] Vine Associates, Inc. 2007. Plymouth Harbor Dredge Alternatives Study.
[32] Plymouth Cordage Company. 1929. Plymouth Cordage Company: 100 years of service. The University Press. Cambridge, MA.
[33] 314 C.M.R. 9.02. 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States Within the Commonwealth.
[34] *Ibid.*

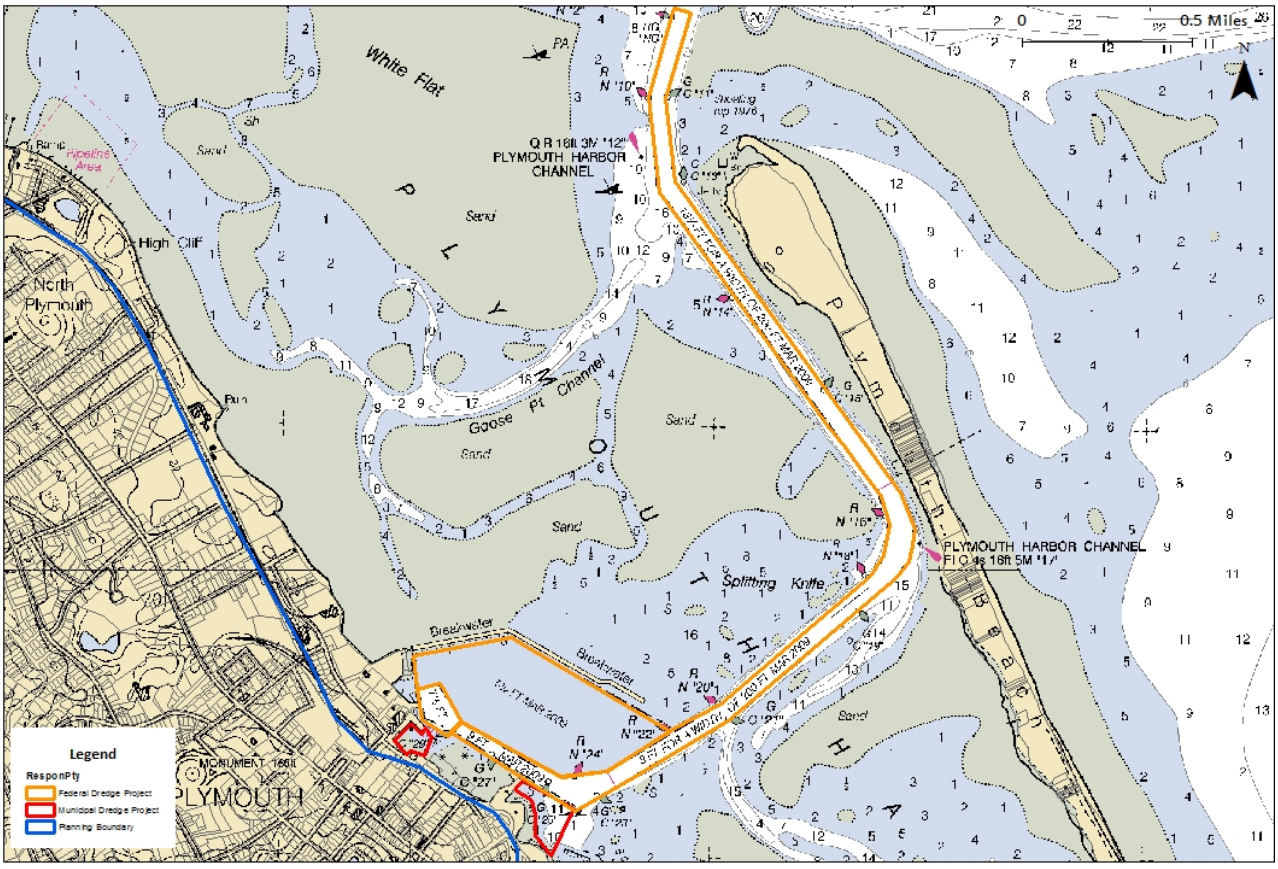
Table 6: Dredging Activity in Plymouth Harbor ("—" indicates no data available)

Dredge Location	Last Dredging	Design Depth (feet)	Current Depth (feet)	Need for dredging	Volume (cubic yards)	Estimated cost of dredging ($)	Lead Entity
Channel Entrance	1987	11.5	6	Yes, there is an immediate need	100,000	--	Army Corps of Engineers
Turning Basin	1916	15	8	Yes, there is an immediate need	30,000	--	Army Corps of Engineers
Mooring Field – Plymouth Rock	1956	15	3	Yes, there is an immediate need	45,000	--	Town of Plymouth
Mooring Field – Federal Anchorage	1967	8	4	Yes, there is an immediate need	--	--	Army Corps of Engineers
Town Pier	1952	14	6	Yes, there is an immediate need	36,000	2,500,000	Town of Plymouth
Plymouth Yacht Club	2010	7	--	Yes, there is an immediate need	4,100	--	Plymouth Yacht Club
Brewer Plymouth Marine	1997	--	--	Yes, there is an immediate need	20,000	$1,000,000+	--
Cordage Channel	--	--	--	--	--	--	Army Corps of Engineers

In addition to the maintenance dredging, Plymouth would also benefit recreationally and economically from improvement dredging to open new areas of the Harbor and create additional opportunities for use. Specifically, a new dredge project between Town Wharf and the State Pier could provide access for additional dockage and moorings. However, this dredging is largely intertidal and would require extensive environmental testing and permitting. There is a severe shortage of funds for dredging overall, making it difficult to obtain funds for important new dredge projects when there are ongoing maintenance dredging needs to address.

While both maintenance and improvement dredging are greatly needed in Plymouth waterways, there are many challenges, in addition to funding, that impede the completion of these projects. First, the project planning, permitting, and environmental assessment process for dredging projects can be complex and lengthy. The process normally involves the following steps (Note: the exact order of the steps may vary depending on the project; some steps may also not be needed):

- Conduct survey to verify shoaling and the need for dredging, and identify the project plan.
- If the project will remove more than 10,000 cubic yards, conduct an environmental assessment to determine the potential environmental effects of the dredge projects (*e.g.,* disturbance of benthic communities, turbidity), and test the dredge material through a comprehensive sampling plan. Both a physical and chemical analysis of the sediment is needed



Plymouth Harbor Management Plan: Dredged Areas

Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - April 2016

Figure 14: Federally Dredged Areas in Plymouth Harbor

to determine the type of material and if there is any contamination.

Obtain the needed permits for the project. Permitting for the project will occur concurrent to or after the environmental assessment. To obtain the water quality permit and determine the disposal location, the dredge sediment will need to be tested and characterized. While small maintenance dredging projects (less than or equal to ½ acre) are eligible for self verification and do not require regulatory review by the Army Corps of Engineers, maintenance dredging projects greater than ½ acre, and *all* improvement dredging projects require Army Corps review. The level of regulatory review and permitting is generally more rigorous for new dredging projects greater than ½ acre and 10,000 cubic yards and for maintenance dredging projects that impact tidal special aquatic sites or intertidal areas. The specific Army Corps of Engineers requirements for maintenance and improvement dredging can be found in General Permit 5 of the General Permits for Massachusetts[35]. If the project will remove less than 10,000 cubic yards, an Environmental Notification Form (ENF), local permitting, a Water Quality Permit from the Department of Environmental Protection, and a Section 404 of the Clean Water Act from the Army Corps of Engineers may suffice rather than a full environmental assessment.

- If the environmental assessment is needed (the project is greater than 10,000 cubic yards), and no significant impact is determined, develop a project plan, budget, and specifications for the project. If significant impact is found, re-evaluate the project and reduce/mitigate any impacts.
- Secure funding for the project in coordination with state and federal resource agencies.
- Select an entity to complete the dredge project through a bid process, and begin the dredge project.

In addition to this lengthy process, securing adequate funding is also a major impediment to completing most dredging projects in Plymouth, and elsewhere in Massachusetts. Funding for dredging can come from the federal government (for areas identified as federal navigation projects, including the Channel Entrance, Turning Basin, Federal Anchorage, and Cordage Channel as noted in Table 6), state governments, municipalities, and other sources. That said, dredging is costly, funding is scarce, and competition for the funding is high, making it very difficult to adequately fulfill all dredging needs. For example, the federal government only receives funding to dredge approximately 3-4 harbors within all of New England each year, and federal funds and appropriations for dredging are generally on a downward trend. Similar issues regarding a lack of funding for dredging exist on the state and municipal level.

The cost of a dredge project is affected by many different elements and stages, including "design, mobilization, marine demolition, dredging, water management, transportation and disposal, construction and EPA oversight, … project management, design and engineering, … permit preparation and fees,"[36] and many other components.

More specifically, the dewatering process can affect cost. Once dredged material is removed from the site, the material often needs to be dewatered (because it is too wet for disposal) which can add additional costs.[37] To process the dredged material for disposal, the water from the wet sediment needs to be removed through either passive dewatering or mechanical dewatering.[38]

[35] Department of the Army. 2015. General Permits for Massachusetts. Online at: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/MAGPs9March2015.pdf.

[36] Naval Facilities Engineering Command. Dredging. Online at: http://www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc/products_and_services/ev/erb/tech/rem/dredge.html.

[37] *Ibid*.

[38] *Ibid*.

Passive dewatering is a method that removes water from dredged materials through drainage or evaporation.[39] The most common and lowest cost passive dewatering method is to allow sediment particles to settle out by gravity and drain using a detention tank or basin.[40] Any water left on the surface may evaporate.[41] This passive dewatering process takes more time than mechanical dewatering, and is most effective when the material is spread to a thickness of 2 to 4 feet, and left in a tank or other flat surface for weeks or months.[42]

Mechanical (or active) dewatering uses a machine to remove the water from the dredged materials. More specifically, belts or plates are used to squeeze out the water from the dredged material.[43] The removed water is then often transported to a sanitary sewer or storm drain system, or recycled.[44]

The disposal location can also add extra costs to a dredged project, and location is often dependent on the type and quality of material dredged. Contaminated soil either needs to be treated to remove the contaminants, or disposed of in a confined landfill or in-water disposal site (*e.g.,* Confined Aquatic Disposal (CAD)). Sampling conducted in 2006/2007 by Vine Associates showed pesticide levels in the sampled areas exceeding levels allowed for offshore disposal.[45] Onshore disposal options include using the material as a landfill cap for an old dump site in South Plymouth. This site would be the best upland disposal option due to its proximity to the dredge area and no disposal cost to the Town.

Uncontaminated soil can be disposed offshore in the ocean (with the necessary permits), or it can be used for beach renourishment. Ocean disposal is the cheapest option, when feasible.

The permitting process for dredge projects can also be lengthy, complex, and costly, further impeding the completion of dredge projects in Plymouth. Depending on the type of dredge project, location, and scope of work, dredge projects will need local, state, and/or federal permits. Often, many agencies can be involved in the permitting process for a new dredge project, depending on the size, scale, location of, and need for the project. Some of these agencies can include:

- Conservation Commission,
- Town of Plymouth Harbormaster,
- Massachusetts Department of Environmental Protection,
- Massachusetts Office of Coastal Zone Management,
- Massachusetts Historical Commission,
- U.S. Environmental Protection Agency,
- U.S. Fish and Wildlife Service,
- National Marine Fisheries Service,
- and/or
- U.S. Army Corps of Engineers.

Additionally, it is important to consider time of year restrictions when proposing a new dredge project, which (while important), add an additional layer of complexity. More specifically, the Massachusetts Division of Marine Fisheries has recommendations for the best time of year for in-water construction. These time of year restrictions are based on life history information on marine fisheries resources, and identifies when there is a higher risk of dredge activities harming marine populations.[46] See the following report for the time of year restrictions on in-water construction: http://www.mass.gov/eea/docs/dfg/dmf/publications/tr-47.pdf.

[39] *Ibid*.
[40] *Ibid*.
[41] *Ibid*.
[42] *Ibid*.
[43] *Ibid*.
[44] *Ibid*.
[45] Gould, David. 2017. Personal Communication re: soil samples in the Harbor.

[46] Evans, N. Tay, et. al. Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts. April, 2011. <http://www.mass.gov/eea/docs/dfg/dmf/publications/tr-47.pdf>

While there are many challenges and complexities associated with dredging in Plymouth harbor, it is greatly needed to ensure safe navigation of Plymouth's waterways, and efforts to streamline projects (*e.g.,* piggyback on other projects to reduce costs associated with mobilizing dredging equipment) will be important moving forward.

Safety

Safe use of the Harbor is of upmost importance and is maintained by the harbormaster's office, which patrols and provides direction and assistance to those in need. Specific safety elements are addressed in the Town's by-laws in the following ways:

- Maximum speed is headway speed within any and all mooring areas within Plymouth Harbor (§81-2(A))
- You are responsible for your wake at all times when operating within Plymouth Harbor and for all damage to public or private property which may be caused by excessive wake coming from your vessel. (§81-2(A))

- Swimming will not be allowed from the state pier, Town pier or floats attached to public docks or the launching ramp area in Plymouth Harbor. (§ 81-6(B))
- Water-skiing shall not be conducted from or within 300 feet of any boat ramp/ access area (§ 81-6(D))
- The operation of personal watercraft shall not be conducted from any boat ramp/ access area, except for initial embarkation and final disembarkation (§ 81-6(D))
- No fishing activity shall be conducted from within a fifty (50) foot radius of any boat launching ramp (§ 81-6(D))
- No person shall operate any motorboat or any vessel in a reckless or negligent manner so as to endanger the life, safety or property of any person. (§ 81-7(B))

In addition, mooring tackle requirements (detailed in § 81-11 and in the mooring section of this report) and inspections reduce the risk of incidents stemming from failing moorings.

4.14 Public Access

As in all communities in the Commonwealth, the Public Trust Doctrine provides for the public's right to access the intertidal area in Plymouth for the purposes of fishing, fowling, navigation, and their natural derivatives. Additionally, people can physically enjoy the water at many designated locations in the planning area, including at Long Beach, Nelson Park, and Stephen's Field.

Visual access is a dominant feature of the downtown waterfront parks and sidewalk, providing views of some of the Town's most significant economic and historic features, including lobster boats, Plymouth Rock, and the *Mayflower II*. Pedestrians can also walk along the town's breakwater where they can fish and experience the Harbor from a different vantage point. For those travelling by vehicle, the Harbor figures prominently in views along Water and Union Streets.

Physical access to the Harbor has been a subject of several studies conducted in Plymouth over the

years[47], [48], [49], and the Town is working to further enhance access to the harbor through the development of a waterfront promenade. Slated to begin construction on the project in 2017, the Town will create a new boardwalk and pedestrian plazas and add wayfinding signage and other amenities between the roundabout and Sandwich Street. Additional discussions about how to improve access in the harbor area include adding piers or wharves between the State Wharf and Town Pier that could allow boat and/or pedestrian access.

Despite the many opportunities to access the Harbor both visually and physically, a shortage of parking in the downtown area makes access difficult during peak times – particularly for those looking to unload people and gear in preparation for a trip aboard one of the many recreational and commercial vessels in the Harbor.

Public access is also limited in that most land on Saquish and Clark's Island is privately owned. The Town of Plymouth does own approximately 60 parcels on Saquish, however many are located on marshland and are not easily accessible.

4.15 Changes in Sea Level and Climate

Climate change is impacting Plymouth and the northeast in several ways, as experienced in the form of rising sea levels, increasingly intense storm activity, alterations to the shape of the coastline, and changes in marine species abundance and distribution.

Sea Level Rise

Climate change models conservatively estimate that sea levels in the northeast could increase 2 to 4.5 feet above 2005 levels by the end of the century.[50] With sharp and immediate reductions in global carbon emissions, sea level rise toward the end of the century could possibly remain less than 2 feet, but given current actions globally, reductions of that level are unlikely. If, however, carbon emissions continue at present levels, sea level rise by the end of the century could be much higher – estimates in Boston suggest as many as seven feet above 2000 levels.[51]

For Plymouth, this means that by approximately 2070, the Town could see a three foot increase in sea level above 2000 levels. If conditions in and along the Harbor remain the same (*e.g.,* elevations at Long Beach remain at present-day levels, seawalls are not constructed/raised, land is not raised), the following notable areas will likely be covered with water at each high tide:

- The parking lot at the State Boat Ramp
- Nelson Beach and the marsh on the backside of the beach
- Properties to the north and south of Stephens Field
- Portions of Long Beach
- A large area of the western side of Saquish

With an increase of five feet above 2000 sea levels, additional notable areas will likely become submerged at each high tide, including:

- Additional areas of Long Beach
- Plymouth Rock
- A portion of Stephen's Field
- Part of Pilgrim Memorial State Park
- Areas adjacent to Brewster Park
- Portions of Brewer Plymouth Marine and the Plymouth Yacht Club
- Most of the western side of Saquish
- The Lobster Hut

[47] Vine Associates, Inc. 2007. Plymouth Harbor Dredge Alternative Study.
[48] Carlone & Associates. 2007. Plymouth Public Space Action Plan.
[49] CBT/Childs Bertman Tseckares & Casendino, Inc. 1992. Plymouth Downtown/Harbor District Urban Design and Preservation Plan.
[50] Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists (UCS).
[51] City of Boston. 2016. Climate Ready Boston.

With an increase in six feet above 2000 levels, much of the shoreline will be impacted, including

- Significant portions of Long Beach and Saquish – the tips of which will be islands
- All of Stephen's Field
- Pilgrim Memorial State Park
- All of Brewers Plymouth Marine
- Parking along Town Pier
- The Centrus Premier Home Care building

Photo: @MA_Sharks

Storm Activity

Under climate change scenarios, it is unclear as to how the intensity, frequency, and path of blizzards and nor'easters will change, but an increase in the intensity of hurricanes is expected. As storms impact Plymouth, they will create storm surge and waves which, on top of elevated sea levels, will cause flooding typical of more powerful present-day storms. The Federal Emergency Management Agency (FEMA) maps the extent of flood-prone areas, using the flooding expected during a "100-year flood", based on historical data, as a standard to show areas that have a 1% chance of flooding to this level each year. As sea levels increase, the annual chance of reaching the current 100 year flood levels will increase, depending on factors including local geography. Information has not been modeled for Plymouth, but to put the risk in perspective, Boston is expected to experience the 100 year storm every 2-3 years by mid-century. Long Beach, Saquish, and the waterfront between the Town Pier and State Pier will likely flood on a more regular basis.

Coastline Alteration

All existing models for sea level rise and flooding use current shoreline conditions to generate their findings; however, increased storm activity and changes in sea level will likely cause alterations to important coastal features such as Long Beach and Duxbury Beach. In addition to their ecological and recreational functions, these barrier beaches are the first line of defense against storms in Plymouth Harbor. A breach in either beach could expose new areas to increased flooding and storm damage.

Furthermore, as the shoreline is re-shaped by rising seas and increasingly intense storms, the sediment within the Harbor may begin to move in new ways, affecting navigation

Changes in Species Abundance and Distribution

During the 1900s, sea-surface temperatures in the northeast increased more than 1°F, and models predict they will increase between 4-8°F by the end of this century.[52] Bottom temperatures are also expected to increase, though less than surface temperatures. These changes in temperature can impact marine life that are sensitive to water temperatures for reproduction, survival, and growth. Among those species being studied to understand links between their survival and water temperature are cod and American lobster – both of which are commercially significant to Plymouth fishermen.

[52] Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists (UCS).

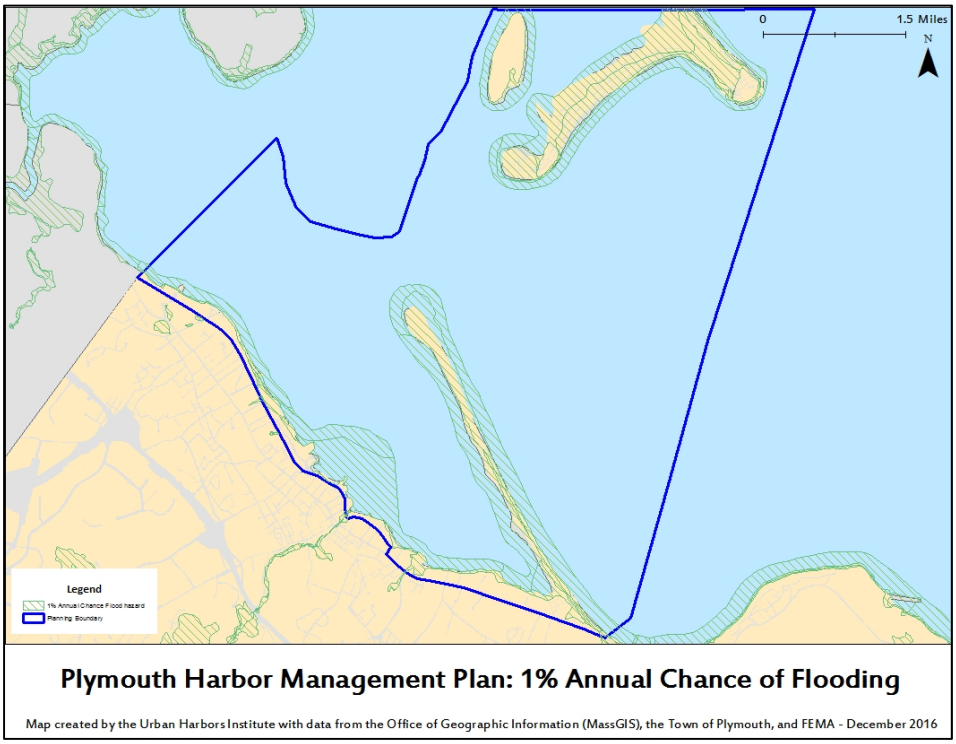
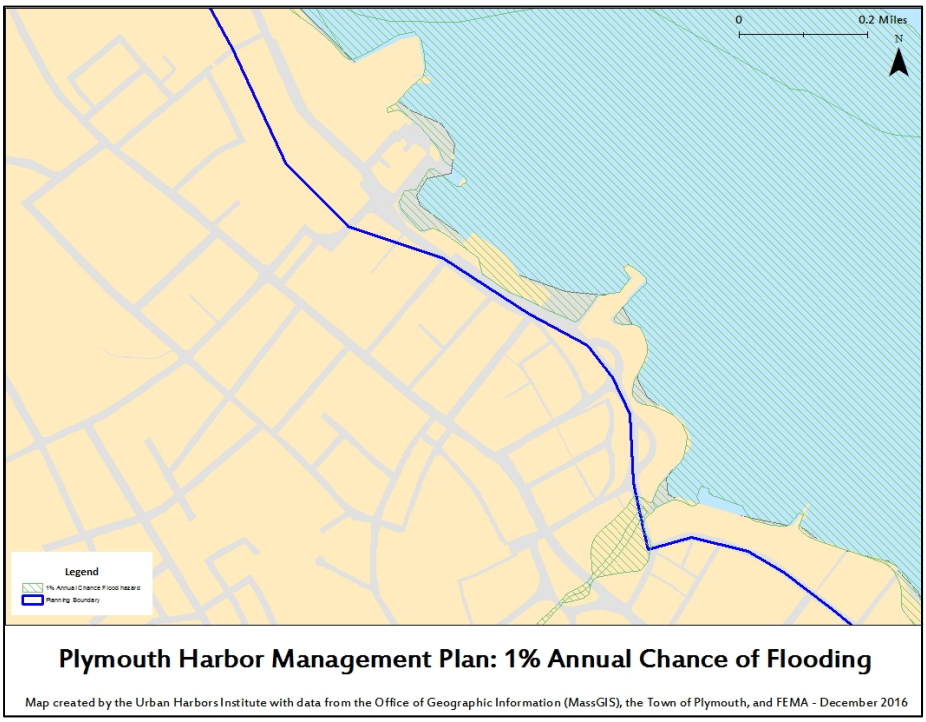

0
1.5 Miles
N
Legend
1% Annual Chance Flood hazard
Planning Boundary
Plymouth Harbor Management Plan: 1% Annual Chance of Flooding
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS), the Town of Plymouth, and FEMA - December 2016

Figure 16: Areas in the planning area within the 100-Year Flood Zone


0
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1% Annual Chance Flood hazard
Planning Boundary
Plymouth Harbor Management Plan: 1% Annual Chance of Flooding
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS), the Town of Plymouth, and FEMA - December 2016

Figure 15: Areas in Downtown Plymouth within the 100-Year Flood Zone

4.16 Historical Resources

The town's rich history has shaped the planning area's present-day natural and cultural landscapes, and will continue to play a significant role in how the area is used moving forward. As such, it is important to recognize that the Harbor, in its various configurations over the centuries, has been supporting humans dating back at least to the Wampanoag, who, long before Europeans arrived, lived along the Massachusetts and Rhode Island coasts during the warm months and established settlements near fresh water resources such as Town Brook. The Wampanoag relied on the harbor's fish and shellfish resources for food, and used shells to create beads that served as jewelry/adornments and currency.

Following the historic 1620 arrival of the Pilgrims in Plymouth, the harbor uses increased as it became central to trade, exploration, ship building, and fishing activity in the region. The downtown area – including its shops and homes – grew around the Harbor, which sustained early life in the colonies, allowing for the arrival of goods, people, and news from home.

With the growth of the colonies, Plymouth Harbor became a major port in the eighteenth century. By the early nineteenth century, an account of the waterfront noted fishing – especially for cod and mackerel,[53] whaling (four vessels[54]), and shipping activities, along with related industries such as boat building, iron foundries and forges, riggers, shipwrights, and accounting offices.[55] In 1846, eight finger piers extending into deep water from between Leyden and North street[56]s supported these maritime activities. This area was filled in around 1920 to create the existing Pilgrim Memorial State Park.[57]

Also central to the town's activities, Town Brook was an active industrial site, supporting grain, fulling, textile, and tanning mills as well as cordage factories and iron forges. Beginning in 1790, the iron forges used bog iron from local kettle holes to create a variety of products including tools, bells, nails, tacks, and rivets.

In northern Plymouth, the Cordage Company – incorporated in June of 1924 – put Plymouth on the map as an industrial center for cordage. The company supplied many whaling ships and clipper ships in its early days, transitioning to other more terrestrial applications for cordage (e.g., lariats, bailing rope) as marine uses of it slowed. With dredging in the early 1900s, the company began to receive much of its oil, coal, and other supplies by vessel, making the Town a major site for the arrival of imports in Massachusetts. In addition to making cordage on-site, the company also constructed housing, school rooms, and other amenities to support its employees. The company, a significant employer of Plymouth residents, closed its doors for good in the late 1960s, creating economic concerns in Town.

[53] Bearse, Ray. 1971. Massachusetts: A guide to the Pilgrim State. Houghton Mifflin Company. Boston, MA.

[54] *Ibid.*

[55] Carlone & Associates. 2007. Plymouth Public Space Action Plan.

[56] CBT/Childs Bertman Tseckares & Casendino, Inc. 1992. Plymouth Downtown/Harbor District Urban Design and Preservation Plan.

[57] Carlone & Associates. 2007. Plymouth Public Space Action Plan.

While shipping and industrial activities dominated northern Plymouth and the downtown harbor area at the base of Cole's Hill,[58] the Manter's Point area became a popular waterfront vacation site, especially following the paving of roads and the installation of a trolley in the late 1800s.

Recreational enjoyment of the Harbor also took place in the form of boating. The Plymouth Yacht Club was active starting in the late 1800s, and the Pilgrim Yacht Club began operations in 1925, buying property at the current site of the Plymouth Yacht Club in 1929. The two clubs joined to form one yacht club in the 1930s.[59]

With the development of roads and railroads, Plymouth began to rely less on shipping and more on land-based transportation of goods, yet the Harbor remained an important recreational and commercial asset, supporting a vibrant fishing fleet and extensive use by recreational boaters.

In 1947, the Plimoth Plantation was incorporated with a focus on telling the town's history. The first construction project, the "First House" opened along the waterfront in 1949 as a visitor center. Additional buildings developed and the museum grew. As part of the museum's efforts to highlight the history of the area, a replica of the *Mayflower* sailed across the Atlantic, arriving in Town to much fanfare in June 1957. Shortly after arriving, the vessel transited a new state-dredged channel and took up residence at the State Pier, where it is visible to visitors throughout the Harbor.

[58] *Ibid.*

[59] Plymouth yacht Club. No date. Club History. Online at: http://www.plymouthyachtclub.org/about/club-history/.

Section 5: Issues, Goals, Objectives, and Recommendations

The following issues, goals, objectives, and recommendations were generated with expert and public input and are not listed in order of priority. Information about the priority level and timeline for implementing these recommendations is available in Appendix A.

Each recommendation includes responsible parties and potential funding sources. As a general recommendation, the Town should explore opportunities to capture more of the harbor-generated revenue for harbor uses (*e.g.,* through a revolving fund, an enterprise fund, or another funding mechanism) in part to assist with implementing the recommendations in this plan.

5.1 Dredging

Plymouth Harbor is subject to the shoaling of sediment, resulting in shallow areas that impede navigation by recreational boaters, commercial fishermen, cruise ships, and others. Water depth also impacts the extent to which the Town can offer moorings and marina facilities. Some areas in Plymouth Harbor have not been dredged since the 1950s and are in immediate need of dredging.

Dredging shallow areas within Plymouth waterways is extremely important for the navigation of boats and the indirect impacts of safe navigation. For example, Plymouth businesses (including shops, restaurants, recreational services, etc.) depend on navigable waters to accommodate transient boaters and tourists participating in water-based activities (e.g., whale watches, pirate cruises) – many of whom will spend money on other activities while in Town. Fishermen also depend on navigable waters to operate their businesses. Additionally, small cruise ships, which would economically benefit the Town, are limited in their ability to enter Plymouth Harbor because of the shallow depths.

If dredging does not occur, there could be a number of impacts with negative economic consequences, including:

- Inability of larger ships, including ferries, cruise ships, larger commercial vessels, and larger charter boats, to navigate and dock in Plymouth Harbor
- Inability of boaters to access moorings
- The potential loss of permitted mooring space
- Potential displacing of the Plymouth commercial lobster fleet
- Limits to the commercial vessels and other boats that can use the pier
- Potential damage to boats and equipment (due to scraping of boat bottom in shallow water) and safety hazards

If dredging does occur, the following impacts are possible:

- Larger ships could enter the Harbor, including cruise ships, tall ships, and other large commercial and recreational vessels
- The mooring field could be expanded with improvement dredging. A reorganization of moorings could potentially increase the number of moorings
- Floating docks and/or additional marina facilities could be constructed to accommodate additional vessels

The above impacts would likely attract more visitors to Plymouth Harbor and create additional economic activity; however the challenges of dredging, including costs and impacts to natural resources are significant, and any dredging would need to be permitted and financed, and mitigation to impacted natural resources may be required.

Issues:

1. Shallow areas and sediment shoaling within Plymouth Harbor can impede navigation, create safety hazards, reduce boat storage space, and damage boats. A variety of areas within Plymouth Harbor are in need of dredging, including the Plymouth Harbor Channel Entrance, mooring fields that are currently tidally dependent, and the Town Pier including the dinghy dock. Dredging around the Town Pier will not only allow additional and larger boats to dock, but it will increase the space around the dock for dinghies and reduce congestion. More details on Plymouth Harbor's public dredging needs can be found in Figures 19 and 20 and Table 7.

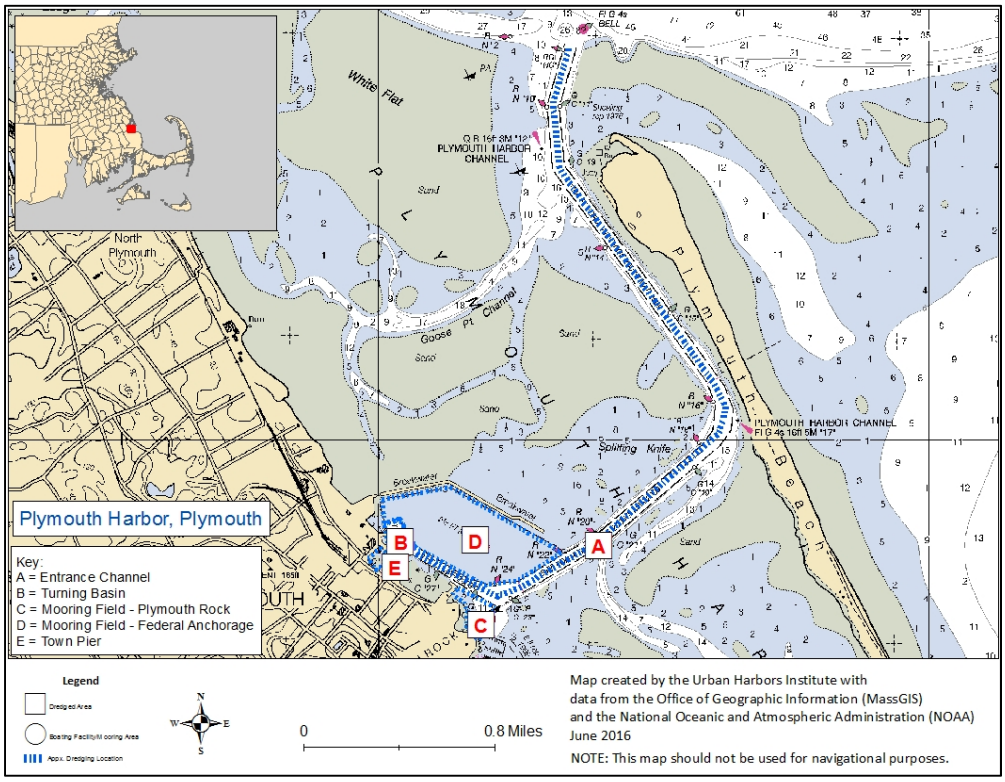

Plymouth Harbor, Plymouth
Key:
A = Entrance Channel
B = Turning Basin
C = Mooring Field - Plymouth Rock
D = Mooring Field - Federal Anchorage
E = Town Pier
Legend
Dredged Area
Boating Facility/Mooring Area
Appx. Dredging Location
0
0.8 Miles
Map created by the Urban Harbors Institute with
data from the Office of Geographic Information (MassGIS)
and the National Oceanic and Atmospheric Administration (NOAA)
June 2016
NOTE: This map should not be used for navigational purposes.

Figure 17: Dredging in Plymouth Harbor

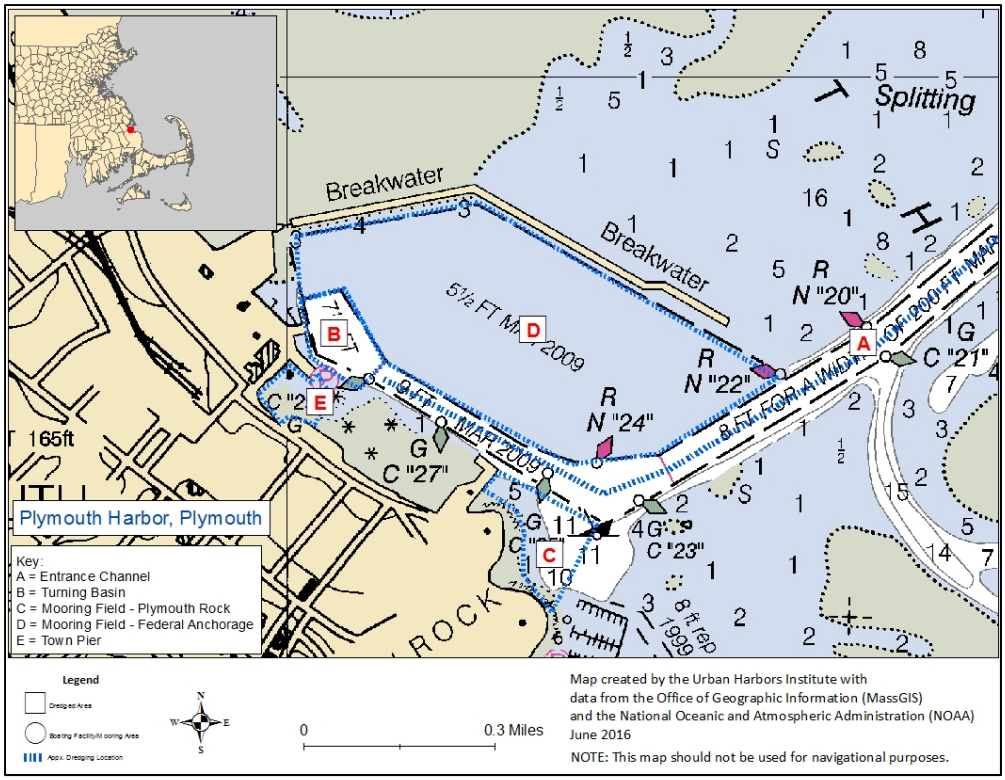


Figure 18: Dredging in Downton Plymouth Harbor

Table 7: Dredging Needs within the Planning Area

Dredge Location	Last Dredged	Design Depth (feet)	Current Depth (feet)	Volume (cubic yards) to be removed	Estimated Cost of Dredging ($)	Primary Funder
Channel Entrance	1987	11.5	6	100,000	Unknown	Federal
Turning Basin	1916	15	8	30,000	Unknown	Federal
Mooring Field – Plymouth Rock	1956	15	3	45,000	Unknown	Municipal
Mooring Field – Federal Anchorage	1967	8	4	Unknown	Unknown	Federal
Town Pier	1952	14	6	36,000	2,500,000	Municipal
Cordage Channel	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

2. Funding for dredging is very limited, and dredge projects can often be costly, greatly hindering the Town's ability to complete needed dredge projects. Costs are increased by the fact that sediment in many areas is likely contaminated and its disposal will increase project costs.
3. There is no written plan for maintenance dredging in Plymouth Harbor, which should include short and long-term dredging needs, costs, priorities, etc.
4. A lack of readily available space for dewatering should dredging occur.

Recommendations:

Goal I: Maintain Plymouth's waterways in a safe and navigable state for all users.

Objective I: Ensure adequate dredging and funding to promote safe navigation in Plymouth Harbor

Recommendation 1. Develop a long-term dredging plan for all waterways within Plymouth Harbor, identifying dredging needs, costs, priorities, dewatering options, and possible funding sources

The Committee should compile past dredging histories and funding sources as the basis for future dredge projects. Specific information should include: date of last dredging, frequency of needed dredging, responsible parties, cost of dredging, source(s) of funding, disposal sites. When considering disposal and dewatering sites, explore whether or not contaminated sediment can be transported to local capped landfills or could be placed in a Confined Aquatic Disposal (CAD) site.

When considering funding sources for dredging (and other harbor projects), explore opportunities to capture more of the harbor-generated revenue for harbor uses (*e.g.,* through a revolving fund, an enterprise fund, or another funding mechanism).

Funding: This recommendation should not require additional funding, aside from time from the Committee.

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee
- Cordage LLC (for Cordage Channel)

Recommendation 2. Acquire the necessary funding to complete dredge projects

Most of the funding for dredging in Plymouth Harbor comes from the federal and/or state government. In recent years Federal authorizations for maintenance dredging has fallen well below need. Consequently, the U.S. Army Corps of Engineers must prioritize proposed projects based on the amount and value of commercial activity that is dependent on the navigation project. Municipal officials and stakeholders must work with federal and state legislators in making a strong case to the Army Corps' New England District to include Plymouth harbor dredging in its next fiscal year work plan.

The Town should also seek new funding sources for non-federal projects, such as funding from the Department of Conservation and Recreation Waterways Division and funding through environmental bond bills (*e.g.,* the $2 million for maintenance dredging currently in an environmental bond bill). Funding from any of these sources will require matching funds provided by local sponsors, such as the municipality and/or businesses.

Responsible Parties

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee
- Department of Conservation and Recreation
- U.S. Army Corps of Engineers
- Private entities wishing to dredge

Recommendation 3. Upon acquiring the necessary funding, complete dredging at key shallow areas as soon as possible

Key shallow areas include: the federal channel and anchorage; around the town wharf and town pier following T-Wharf construction; in front of Brewer Plymouth Marine and the Plymouth Yacht Club; around Buoy 24; off of Cordage Park (both the Channel and to expand the marina); and in the mooring fields.

Funding: The Committee should pursue funding from the US Army Corps of Engineers to dredge the federal channel and any other federal waterways. Additionally, the Committee should pursue state funding from the Department of Conservation and Recreation, as well as other sources.

Responsible Parties

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee
- Department of Conservation and Recreation
- U.S. Army Corps of Engineers
- Private entities

Recommendation 4.Utilize any suitable dredge spoil as beach nourishment in Plymouth

Where feasible, use a dredging method that would allow dredge spoil to be placed onshore for beach nourishment. This will require coordination with the MA Division of Marine Fisheries to identify appropriate disposal site(s), and will require various permits (e.g., under the MA Environmental Policy Act, Clean Water Act Section 410, and MA Chapter 91). If renourishment is not feasible, develop a plan to transport dredged sediment to cap local landfills.

Funding:

- MA Rivers and Harbor Grant Program

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee
- Plymouth Conservation Commission
- MA Division of Marine Fisheries

Recommendation 5.Explore less expensive and more sustainable options for dredging

Plymouth should communicate regularly with neighboring towns to understand whether or not there are opportunities to schedule dredge projects in a way that would reduce overall mobilization and disposal costs for both towns.

Funding:

- MA Rivers and Harbor Grant Program

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

- Plymouth Harbor Committee
- Other municipalities within the region

Objective II: Enhance the efficiency of the permitting process needed for dredging projects in Plymouth Harbor.

Recommendation 1. Develop a strategy for elevating Plymouth's dredging needs among those who make funding and permitting decisions.

Develop a concise description of (1) the importance of navigable waters in Plymouth Harbor, (2) the dredging needs, and (3) the impact of dredging on economic activity within the Town. Additionally, town staff should devote a specified amount of time each month to seeking funding opportunities that support dredging activities, and harbor users should be encouraged to write letters to state and federal elected officials to increase awareness of the town's dredging needs.

Funding: No additional funds are necessary to implement this recommendation, however the Town may wish to bring on additional staff to assist with dredging planning. The additional staff would require funding.

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee

Recommendation 2. Provide a means for the public and user groups to express their support of dredging projects.

Provide an online public forum where Plymouth residents and others can express their support of dredging projects.

Funding: No additional funds are necessary to implement this recommendation, however the Town may wish to bring on additional staff to assist with dredging planning. The additional staff would require funding.

Responsible parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

5.2 Transient Boating

Plymouth's location along the coast between Cape Cod and Boston, rich historical and cultural resources, and proximity to the downtown area with abundant restaurants and entertainment make the Harbor an important tourist and transient boater destination.

Plymouth Harbor, which is a well-sheltered harbor of safe refuge, is the last port (heading South) and first port (heading North) when transiting the Cape Cod Canal. As a result, it is a natural stopover location for the day or overnight in order for boaters to access the channel on a favorable tide.

Plymouth also serves as an international port of entry for transient boaters entering the United States. Boats can register with Customs in Plymouth rather than going to one of the bigger ports of entry like Boston or New Bedford.

The Town maintains 10 dedicated transient moorings. Seven of these transient moorings are located within the inner harbor and three are adjacent to Long Beach. Brewer Plymouth Marine and Plymouth Yacht Club also accommodate transient boaters. Town transient moorings cost $35 for overnight use. If space is limited and transient boaters are placed on a private mooring, usually only for quick day visits, then no fee is charged by the Town.

It is common to see boats from nearby Scituate, Marshfield, and Duxbury coming to Plymouth for a day visit, as well as boaters from more distant locations such as Nova Scotia. In addition, some boaters will launch their boat from a boat ramp in Plymouth and then stay overnight in the Harbor.

Transient boaters on moorings are serviced by a launch operated by Water Sports. The launch generally runs from 8:00 a.m. to 11:00 p.m. The roundtrip cost for same-day service is $24 for 4 people ($600 per year) and is not included in the price of transient moorings. It is important for Plymouth to promote transient boating and ensure a welcoming atmosphere for visitors.

Issues:

1. Plymouth is not maximizing the number of transient boaters through effective promotion and availability of beneficial amenities.
2. Transient boater facilities are lacking, including the mooring and slip space, but also shore side facilities such as bathrooms, showers, and laundry. The Town is currently looking into funding for a maritime center to address the shoreside facilities and Harbormaster needs. Maintenance dredging for the mooring field and channel are needed to open areas where access is currently tidal dependent. Overcrowding also is a longstanding problem.
3. Important services, i.e., fuel (gas/diesel), pump-out, and water for wash down, are all located at the Town Pier and are used by both recreational and commercial users. As a result, there is often a backup of boats waiting for some combination of services.
4. There is no formal contract between the launch operator and the Town. As such, there is no means to ensure reliable hours of operation. Currently, the hours of operation are reportedly not convenient for boaters who wish to get to/from shore earlier in the morning or who wish to stay onshore later at night. Alternatives to the pay-as-you-go system, such as a seasonal pass, multi-trip cards, etc., should be explored to improve vendor efficiency and boater acceptance.
5. Although the downtown area is condensed with plentiful and easily accessible restaurants and attractions, it does not have a marine products store - a common need for transient boaters.

Goal I: Improve infrastructure for transient boaters

Objective I: Provide more dock and mooring space for transient boaters

Recommendation 1. Continue to provide transient space in the Harbor at dedicated moorings and at private moorings, when possible

As the Town looks to expand its transient accommodations, it should, at a minimum, maintain existing levels of access.

The Town should continue to coordinate with private facilities to ensure that transient needs are met.

Sources of Funding: No additional funding is needed to implement this recommendation

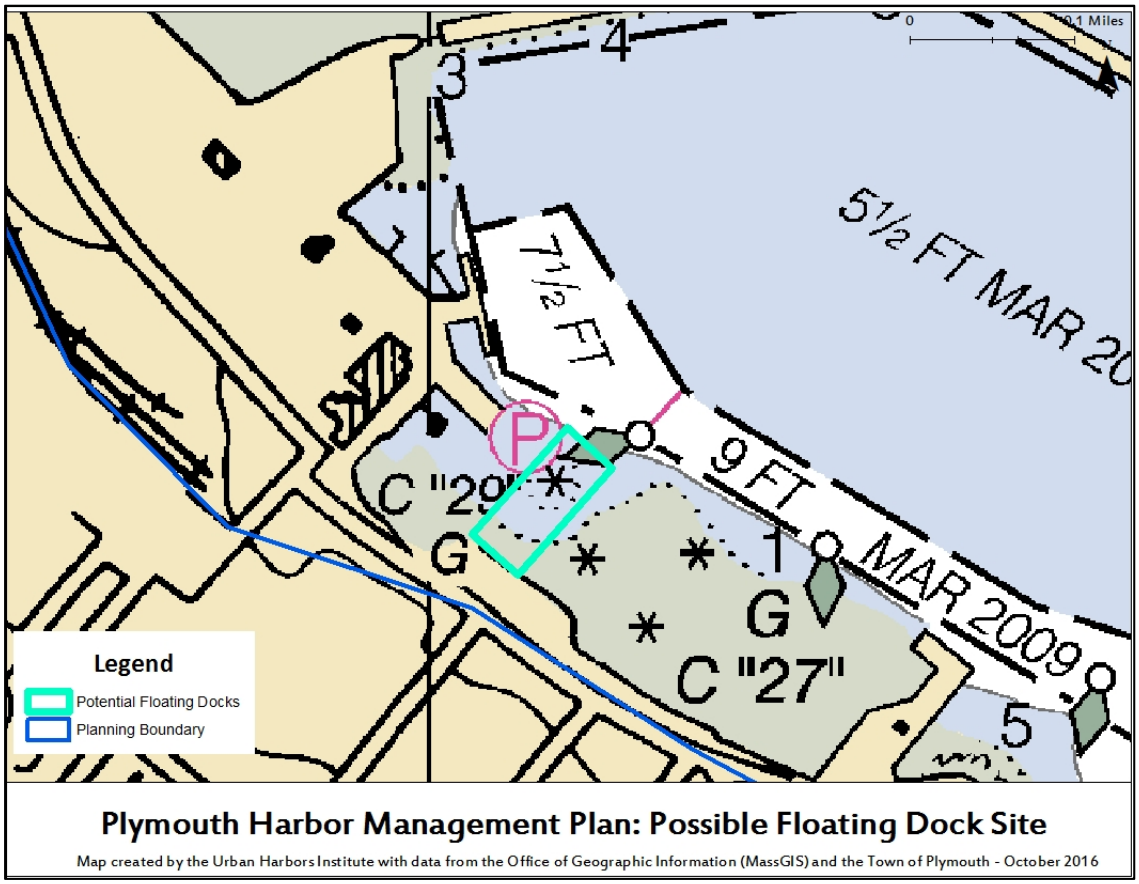
Responsible Parties

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Develop and implement a plan for adding transient space within the Harbor

The Town lacks sufficient transient space, and there are several options for accommodating more transient boats in the Harbor. The Town should conduct an assessment of their options, taking into consideration factors such as: (1) how many berths are needed for what size vessels; (2) is the Town interested in options that require dredging; (3) would the Town want to operate a marina; and (4) what other considerations (e.g., impacts to eelgrass, impacts from proposed sea level rise, impacts to other harbor users such as aquaculturists and commercial fishermen, launch requirements, tender access, yacht access) should be evaluated. Once the assessment is complete, the Town should decide which option is most appropriate, and begin to secure the permits, plans, and funds necessary for implementation. As part of this, the Town might want to consider conducting a study to determine the financial impacts of transient boating to the Town. The options that have been identified to date include:

A. A 200 to 300 foot floating dock system in the Harbor for transient use. This dock could be located in the northwest part of the Harbor with a gangway up the rip rap to provide quick access to downtown (see map below). This dock could accommodate dinghies and transient vessels of various sizes. This dock could also serve as a wave attenuator if built appropriately.



B. Four alternatives for marinas in the downtown area between the State Pier and Town Dock, as proposed in The Vine Associates' Dredging Study. Each marina was evaluated based on the need for dredging, the number of slips available, the parking and restroom

requirements, impacts to private owners, connections within the Harbor, and costs. Some of the options would require improvement dredging.

C. A re-gridded mooring field that captures additional moorings for transient use. As part of this, consider using flexible rodes ("conservation moorings") to increase density in the mooring field.

D. A transient leasing program to accommodate long-term transients. Moorings in this program would be acquired through the re-gridding of the mooring field or through the re-capture of moorings when they become available.

Sources of Funding

- US Fish and Wildlife Service BIG Grant
- Seaport Economic Council
- DCR Waterways Program
- Boaters using the facility

Responsible Parties

- Plymouth Department of Marine and Environmental Affairs
- MA Department of Conservation and Recreation
- U.S. Army Corps of Engineers

Goal II: Increase the number of transient boaters visiting Plymouth Harbor

Objective I: Offer amenities and services to transient boaters to increase transient visits and improve overall visitor experience

Recommendation 1. Improve access to key transient services (e.g., fresh water and fuel) at locations that minimize boater overcrowding (e.g., frequent congestion at Town Wharf)

Consider providing water service via barge, and look consider programming at the new wharf to meet the needs of commercial users, thus relieving congestion at the Town Pier.

Sources of Funding:

- US Fish and Wildlife Service BIG Grant
- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Improve transient facilities

Plans for the new harbormaster building include transient bathrooms, showers, and laundry facilities. Additional amenities such as seating and picnic tables should also be considered for the area surrounding the new facility. If transient moorings are expanded significantly in the Harbor, efforts should be made to ensure that the new facilities are adequate.

Sources of Funding:

- US Fish and Wildlife Service BIG Grant

- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3. Improve launch services to meet the needs of boaters in the Harbor by modifying the fee structure to include launch service, extending launch hours, and formalizing a contract with a launch provider

Boaters have commented that paying for launch services in addition to the transient fee makes them feel like they are constantly paying for more services. By incorporating the launch service into the transient fee, boaters can pay a one-time fee and not be reminded of additional payments. The Plymouth Yacht Club, as reference, charges $65/night for a transient mooring. The price includes access to the club's amenities and launch service. In addition, efforts should be made (e.g., an informal survey of launch users) to understand the demand for launch services outside of the existing hours, and if possible, hours should be extended to meet the demand or an Uber-style water taxi should be considered as an alternative to meet needs outside of regular launch hours. Lastly, the Town should formally contract with the launch provider or consider providing its own launch service in order to ensure that all expectations are met.

Sources of Funding:

- Costs should be covered by fees associated with providing the launch service

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Launch provider

Recommendation 4. Offer special amenities to transient boaters to make their visits positive experiences

Consider offering services such as newspaper, coffee, and food delivery to boats on transient moorings; ensure good customer service throughout the transient stay (including welcoming them as they enter the Harbor, etc.); provide each boat with a welcome bag, which could include coupons for restaurants and shops downtown; create an informational brochure for boaters with maps to downtown, information about where to dispose of trash, obtain fuel, pump-out, purchase supplies, etc.; and offer online reservations through a program such as Dockwa or Online Mooring. The welcome material could be provided by the launch service or could be handed out at the new transient facility and the Plymouth Visitor Center.

Sources of Funding:

- US Fish and Wildlife Service BIG Grant

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Department of Marine and Environmental Affairs
- Plymouth Area Chamber of Commerce
- Destination Plymouth
- Local businesses

Recommendation 5. Create short-term transient opportunities for those looking to get food at Woods, Cabby Shack, and other local restaurants

Opportunities could include floating docks at the State Boat Ramp or the new wharf.

Sources of Funding:

- US Fish and Wildlife Service BIG Grant

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 6. Increase availability of marine products for transients

Encourage downtown businesses to carry boating supplies, as appropriate. Advertise these businesses in the transient welcome package.

Sources of Funding: No additional funding is needed to implement this recommendation

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Downtown businesses
- Plymouth Department of Marine and Environmental Affairs

Objective II: Increase marketing to appeal to transient boaters

Recommendation 1. Increase advertising to attract transients and generate revenue for the Town

Promote Plymouth as a transient boating destination. In particular, target transients coming to/from the Cape. Strategies include creating a transient-focused and welcoming website, offering online mooring reservations through Dockwa, developing an on-line boaters guide to Plymouth Harbor, posting advertisements in boating magazines and on boating websites (e.g., New England Boating: http://newenglandboating.com/), conducting outreach at boating shows, and participating in programs such as "Stay Local Boating in Massachusetts" (online at: http://staylocalboatma.com/).

Sources of Funding:

- Private funding from local businesses
- US Fish and Wildlife Service BIG Grant

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Downtown businesses
- Plymouth Department of Marine and Environmental Affairs

Goal III: Improve infrastructure for transient boaters

Objective I: Understand the financial impact of transient boating activity to the Town and region.

Recommendation 1. Use Dockwa data and surveys of local businesses and transient boaters to assess the financial impact of transient boating activity to the Town and larger region.

Transient boating activity is important to the local economy, but data is not available to quantify the significance. Understanding the economic impacts associated with transient boating will help the Town make decisions regarding such activities as dredging and expansion of transient amenities. Furthermore, data about the economic impact of transient boating might be useful in making compelling funding requests to grant-making entities.

Sources of Funding:

- Seaport Economic Council

Responsible Parties

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Department of Economic Development and Tourism
- Academic institution or economic consultant

5.3 Moorings

Mooring locations in Plymouth Harbor include four town mooring fields and moorings located off of the Plymouth Yacht Club. Together, these mooring fields contain approximately 600 moorings. In addition, about 15 waterfront homeowners have moorings off their property. These private moorings are generally located in the vicinity of Plymouth Boat Yard and off of Long Beach. The mudflat conditions found in much of the planning area make it challenging to find suitable mooring locations for waterfront property owners.

The popularity of local boating is reflected in the fact that, as of August 1, 2016, the waitlist for a town mooring consisted of 337 applicants – a dozen of whom have been on the waiting list for ten years or more. This long waiting list is burdensome to residents and also contributes to congestion at the boat ramp. The list is not stagnant, however, and moorings generally open up on a regular basis. Availability is often related to the price of fuel, as some boaters may decide to sell their boat or not use it for the season if the price of fuel is too high.

The Town is in the process of creating a GIS mooring map that shows each mooring, the boat name, and the boat size. In addition, the Town is considering options to re-grid the mooring field. A "non-interference" grid system (where the boats would never overlap in their swing) would decrease the number of moorings in the Harbor; therefore, it would be beneficial to use a gridded system that allows for interference. Another option the Town is considering is using conservation moorings (elastic rodes) to shorten the scope and therefore allow more moorings in the Harbor. These conservation moorings could be installed first on transient moorings in the town mooring field as a demonstration project. As boaters become more familiar with these flexible rodes, the Town could apply for grants to help subsidize the cost to boaters of replacing conventional rodes and creative an incentive for them to do so. The area near Brewer's Marine could be a good future location for conservation rodes.

Dredging is a frequent challenge and also is needed in the mooring field. There is a need to balance competing concerns for the need for more moorings with finding an appropriate location for them, and at the same time not taking away harbor space from other local users.

It is difficult to find parking near the waterfront. Many local restaurants offer valet parking and park the cars in any available spaces. There used to be available parking for permit holders along the waterfront in the area of the Lobster Hut; however, these designated parking spaces have been removed.

Available dinghy space and overcrowding is a longstanding problem. Boaters report that there is often not enough space for all the dinghies seeking to tie up at the dock. In addition, non-motorized vessels

are often struck and damaged by the motors on other boats. Additional floats could alleviate space conflicts and make daily operation easier.

Issues:

1. Mooring demand is high and availability is limited.
2. Dredging is needed in the mooring field. Improvement dredging would potentially expand the mooring area in the Harbor and accommodate additional moorings while maintenance dredging would be limited to the exiting mooring areas.
3. Space could be used more efficiently to reduce the lengthy mooring waiting list.
4. Boaters have difficult accessing their moorings due to limited waterfront parking and overcrowding at the dinghy docks.

Goal I: Revise moorings to increase capacity and enhance organization within the mooring fields

Objective I: Install new moorings and reconfigure existing moorings

Recommendation 1. Increase the number of moorings available to boaters in the planning area

There are several opportunities to expand the number of moorings within the Harbor, including adding moorings in Hobbs Hole; dredging the mooring field to capture currently unusable space; reconfiguring the existing (or dredged) mooring field to accommodate more boats (see Duxbury and Provincetown as potential models); exploring different mooring methods (*e.g.*, flexible rodes, floating docks for tie up), or opening new areas through improvement dredging. Prior to making a decision about how to increase the number of moorings in Town, consider conducting a mooring utilization and carrying capacity study, taking into consideration factors such as the number of additional moorings needed/desired, the size of vessels that would be accommodated on moorings, types of moorings needed/desired (e.g., transient, commercial, resident recreational), number with tenders or dinghies, impacts to natural resources (*e.g.*, water quality, shading of sea floor, physical impacts to sea floor from contact with the vessel or mooring equipment), and any other relevant factors. If mooring fields are reconfigured, grid patterns and re-numbering of moorings should be considered in order to improve boaters' abilities to locate moorings efficiently.

If mooring numbers are increased, plans to increase dinghy storage should also be considered.

Efforts to place moorings in exposed areas should take into consideration increased risks to vessels and related impacts to the environment (*e.g.,* fuel/oil spills from sinking vessels, impacts to marine resources if a vessel breaks loose and goes aground).

Any mooring reconfiguration plan should be made public prior to implementation in order to allow for public comment.

Funding:

- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Either as part of a mooring expansion or smaller re-organization project, develop and implement a new mooring numbering system that allows boaters to quickly and easily locate moorings. Consider special markings for transient moorings

Funding:

- Plymouth Waterways Fund

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3.Place transient moorings for the yacht club in one grouped location

Funding: No additional funding is necessary to implement this recommendation

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Yacht Club

Recommendation 4.Maintain the online mooring map, updating mooring locations and other attributes of each mooring on an annual basis

The Department of Marine and Environmental Affairs has mapped its existing moorings, identifying features such as boat length and name. This mapping effort should continue, especially with the reconfiguration of mooring fields. The mooring map should remain available online and in hard copy to facilitate its use, and it should be updated annually.

Funding: No additional funding is needed to implement this recommendation

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Objective II: Ensure sufficient infrastructure to accommodate increased moorings

Recommendation 1. Increase the amount of dinghy space to meet current demand and ensure that any increase in the number of moorings includes expanded dinghy space or launch/tender service as appropriate

Possible locations for additional dinghy spaces include the State Pier and floating docks off of the new wharf. Dinghy storage should be considered at any new dockage in the Harbor (e.g., a marina).

Funding:

- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Improve shoreside space and parking for loading and unloading so mooring users can more easily transport their gear from their vehicles to the launch or to their dinghies

Loading and unloading spaces could be designated in the State Boat Ramp parking lot or in one or two waterfront spaces if floating docks are installed in the Harbor for transient use. Also consider designating a seasonal permit-only section of the parking lot near Woods Seafood for use by mooring holders only. Mooring holders could purchase parking permits as an addition to their mooring fee. A survey of mooring holders could assist with determining the number of needed permit-only spaces.

Funding:

- Plymouth growth and Development Corporation

Responsible Parties:

- Plymouth Growth and Development Corporation
- Plymouth Department of Marine and Environmental Affairs
- Plymouth Board of Selectmen

5.4 Public Access

Public access to the water, which includes both visual and physical access, is a defining feature of the Town. There are many opportunities to physically access the water, such as at Nelson Park, Stephen's Field, and Long Beach. Nelson Park was recently renovated, adding a splash pad, boat ramp, and bike path. Planning for renovations at Stephen's Field are currently underway and will create new playing fields and other resources for the town's residents and visitors. Access by boat is also available at the state boat ramp and the ramp at Nelson Park. Small boats can also be launched at Stephen's Field. Boaters can also rent a dock or mooring space in the Harbor or up at Cordage Park, and can access the water through boat and jet ski rentals. The public can visually access the waterfront from the walkways along the Harbor, notably along Water Street, as well as from waterfront businesses. Efforts to increase visual access are underway with the planning of the Pier at Cordage Park.

Though there is a great deal of public access along the waterfront today – especially in the Harbor Planning Area – the Town of Plymouth is interested in creating a more inviting downtown waterfront, increasing the economic vitality of downtown and the Harbor, and enhancing the attractiveness of major public spaces. In 2014, the Town developed a new design for the waterfront that would result in a $15 million waterfront makeover. This new design would enhance the streetscape facing Plymouth Harbor, and would widen sidewalks, install lighting, plant new trees, install kiosks and signs, and make other improvements. The Town is also looking to improve access for commercial and recreational users of the water and waterfront. In particular, there is a need to improve parking, loading/unloading space for people and equipment, and alternative transportation options to and from the Harbor.

Issues:

- The harbor and waterfront is experiencing traffic, congestion, and safety issues due to limited access options.
- Parking for those accessing the Harbor and waterfront is not currently adequate, and there is a need for drop off/unloading locations for people using boats in the Harbor.
- Waterfront parking and the seawall are, in some places, barriers to visual access (the wall is a particular barrier for kids and those in wheelchairs).
- The pedestrian public access walkway is not continuous, does not contain signs, and is in need of maintenance and upkeep.
- The current lighting plan around Plymouth Harbor (e.g., from the rotary, down the pier, and around to Cabby Shack) is not sufficient, is haphazard, and is not uniform.

Goal I: Provide access that will help elevate and position the waterfront as the commercial, recreational and cultural hub of the Town.

Objective I: Attract residents and visitors to the waterfront by improving accessibility to and along the waterfront.

Recommendation 1. Improve lighting along the Harbor

Plymouth needs improved and more uniform lighting around the publicly accessible portion of the Town Wharf to enhance accessibility. Additional lighting will also improve the safety of the area. Black lamps, similar to those used in the center of town, could be used for lighting. Lighting is a component of the town's plans to upgrade the waterfront, and efforts should be made to ensure that the placement of lights is appropriate in key areas such as the town pier.

Funding: The Town is currently seeking funding for these upgrades as part of its waterfront improvement plans

Responsible Parties:

- Plymouth Department of Public Works
- Plymouth Growth & Development Corporation
- Plymouth Department of Economic Development and Tourism

Recommendation 2. Ensure adequate vehicle access to and parking for the waterfront and Harbor

Plymouth is in need of better parking and general vehicle access for those using or viewing the waterfront and harbor. Certain aspects of the current parking situation should not be changed, such as the 15 minute parking in front of Woods Restaurant. Parking-related improvements could include the following:

- Instituting a drop off/unloading location for people using boats in the Harbor
- Developing a parking area for those with a parking permit (perhaps tied to a mooring permit)
- Developing a parking area for waterfront restaurant valet parking

New parking areas should not be located directly adjacent to the waterfront, as this would impede visual access to the Harbor (see Objective II).

Funding:

- Plymouth Growth & Development Corporation

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Growth & Development Corporation

Recommendation 3. Support the Town's efforts to improve the quality, connectivity, and safety of pedestrian infrastructure to and along the waterfront

The Town is in need of a continuous pedestrian walkway around the perimeter of Town Wharf which will connect to the Water Street pedestrian improvements on either end. This will improve the pedestrian links between the downtown and the waterfront. The Town is working on plans to develop this walkway which will require new sections of walkways where none exist, and upgrades to existing areas. For example, the walkway from Captain John Boats to Anna's Harborside Grille is haphazard with minimal instructions to the visitor as to how to cross street

(e.g., a crosswalk may be useful). The town's plans will also consider installing additional lighting and other amenities around the new walkway, as needed. The Harbor Committee should participate in planning meetings to ensure that access issues related to the waterfront are adequately addressed.

Funding:

- No additional Funds are needed to implement this recommendation

Responsible Parties:

- Plymouth harbor Committee
- Plymouth Department of Public Works

Objective II: Maintain and improve visual access to the waterfront and harbor.

Recommendation 1. Additional parking lots, not located directly alongside the waterfront, should be considered

See Objective I.

Recommendation 2. Consider developing dedicated viewing stations alongside the Harbor

The lookouts would provide visual access over the seawall, be kid-friendly, and wheelchair accessible, and potentially contain a kiosk or other educational feature with information about Plymouth's history. These lookout spots should be incorporated into the waterfront improvement project.

Funding:

- The Town is currently seeking funding for their improvement plan. These viewing areas should be incorporated into that plan.

Responsible Parties:

- Plymouth Harbor Committee
- Plymouth Department of Public Works

Objective III: Ensure adequate public access to the Harbor and waterfront by vessel.

Recommendation 1. Explore opportunities to improve/expand ramp access

Boaters have noted the need for additional ramps to launch and haul out boats. Improved ramp access could occur at locations such as at Stephens Field, Cordage Park (Boundary Lane), and Nelson Park.

Funding:

- US Fish and Wildlife Service BIG Grant
- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Increase transient access

See Transient Section for Specific Recommendations

Recommendation 3. Improve ferry service to and from Plymouth Harbor

The Town should encourage increased ferry and/or water shuttle service to and within the Harbor, including additional ferry service to Long Beach and other popular access sites. As part of this expanded ferry service, consider identifying a central hub from which ferries would leave. This would likely enhance economic activity within the Harbor, while alleviating some vessel congestion within the Harbor. The Town should participate in the state's Water Transportation Advisory Council and ensure it is included in the forthcoming (2017) water transportation study and plan.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Private businesses

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Private businesses

Recommendation 4. Explore opportunities for a community boat house

A community boat house could provide Plymouth residents with increased boat access to the water. The boat house could support small boat programs such as sailing, rowing, paddleboarding, and kayaking, in addition to those programs already offered by entities such as the Plymouth Yacht Club and Brewers.

The community boat house could be operated on town-owned property (e.g., Stephen's Field, at the Maritime Center, or a different locale) and run by a non-profit corporation. If the Town used Stephen's Field for the boat house, the existing boat ramp would need dredging and a new channel would need to connect that area to the Harbor.

Funding:

- Community Preservation funding

Responsible Parties:

- Stephen's Field Committee
- Plymouth Department of Marine and Environmental Affairs
- Private businesses

Recommendation 5. Develop and construct more dock space for dinghies and small boats, and promote efficient use in these areas

Potential areas for additional dock space could include: a larger dock on the south side of the state pier; a new dock on the north side of the state pier; along the boat ramp float; and possibly some docks at Stephen's Field (assuming that area is dredged). Any new dockage in the Harbor should take into consideration the potential for dinghy storage.

In addition to increasing available space, ensure efficient use in these areas. As part of this, consider amending the town by-laws to include a definition of a dinghy to ensure that larger vessels do not tie up to these dinghy docks. Additionally, include language in the by-laws limiting

the use of these areas to dinghies. Post signs to identify docks for use by dinghies only, and enforce the dinghy-only rule.

Funding:

- US Fish and Wildlife Service BIG Grant

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 6. Provide additional secure space for land-based small boat storage such as canoes and kayaks

Potential sites for additional small-boat storage includes the space under the forthcoming transient boating facility near the State boat ramp. Ensure that sites are secure to prevent vandalism and theft, and create plans for removal of craft during storm events if necessary.

Funding: A small fee associated with boat storage could cover the costs of maintenance at these locations.

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Private businesses

Recommendation 7. Expand for-hire boat service within the Harbor

The Town should consider increasing the launch service for the Harbor, including expanding the hours and ensuring that the service continues throughout the season. The Towns should also explore the idea of a water-shuttle within the Harbor. The shuttle could make stops at useful and popular locations such as Cordage Park, the *Mayflower II*, the Town Pier, and Long Beach.

Funding: The cost of the launch could be included in the mooring fees, or the Town could run its own launch. The cost of a water shuttle could be offset by usage fees.

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Department of Economic Development and Tourism
- Private businesses

Objective IV: Increase types of access for recreation opportunities within the Harbor.

(See Tourism Section for Additional Recommendations related to this topic)

Recommendation 1.Promote swimming in Plymouth Harbor

In addition to swimming on Long Beach, swimming regularly takes place at Nelson Beach. Additional public swimming sites within the planning area are limited based on land ownership, harbor safety, parking, and sediment quality, however events such as open-water swimming races, triathlon, and plunge events (e.g. penguin plunge) in the Harbor could provide opportunities for swimmers to enjoy the Harbor in a safe manner.

Funding:

- Corporate sponsorship and fees associated with events could cover the costs of open water swims and plunge events

Responsible Parties:

- Plymouth Harbor Committee
- Non-profit groups (events are possible fund-raisers)

Recommendation 2. Create seating opportunities in the town wharf area

As the Town considers plans to develop a new walkway for the Town Pier area, consideration should be given to enhancing seating and eating opportunities by adding tables with seating, and green space for people to sit down, relax, and/or eat food that they brought themselves or food that they purchased from one of the restaurants in the area. Efforts should be made to ensure that seating does not interfere with pier operations.

Funding:

- Funding for this should be incorporated into the costs of the project.
- Benches and picnic tables could be donated/sponsored (e.g., in memory of someone, by a company, or by a family)

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Department of Public Works

Recommendation 3. Explore opportunities to improve the connection from Cordage Park to downtown Plymouth

Consider land-based (*e.g.*, a shuttle or tram) and water-based (*e.g.*, a water taxi) opportunities, focusing on ridership and economic factors associated with the development, operation, and maintenance of the connecting service.

Funding:

- Planning assistance could possibly be provided by the U.S. Department of Transportation's Transportation Planning Capacity Building Peer Program and/or their Local Technical Assistance Program
- The service could be run by a private business
- Fees from use could be set to cover the costs

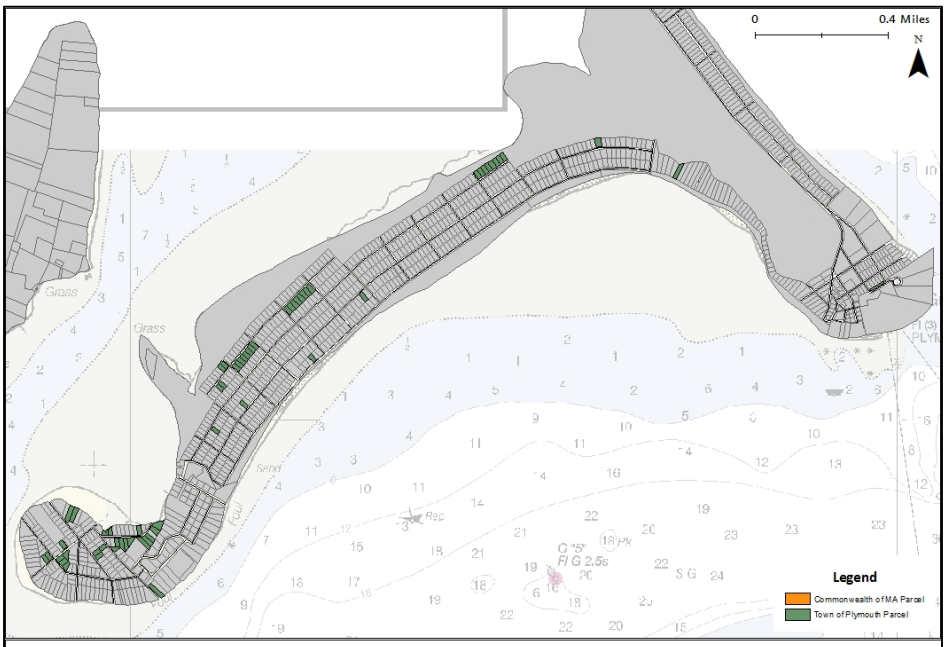
Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Chamber of Commerce
- Plymouth Department of Public Works

Recommendation 4. Maintain the integrity of the publicly-owned properties on Saquish while their potential for natural resource protection, public safety, and/or public access is explored

As shown in the figure below, the Town owns several waterfront parcels that could be preserved for natural resource purposes, accessed by day-trippers, or used to serve some other purpose.

The Town should work with stakeholders to determine the most appropriate course(s) of action for the parcels.



Plymouth Harbor Management Plan: Public Land (Saquish)

Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - April 2016

Funding: No additional funding is needed to implement this recommendation

Responsible Parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

Recommendation 5. Maintain safe public access at Brown's Bank and Plymouth Beach

Funding: No additional funding is needed to implement this recommendation

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

5.5 Recreational and Commercial Fisheries and Aquaculture

One of the most visible activities in Plymouth Harbor is commercial fishing. Ranging from charter boat operations to lobstering to fishing for species including dogfish and striped bass to aquaculture, fishing activity creates jobs and contributes to the character of the downtown waterfront. With renovations to T Wharf and the new state boat ramp, the industry has seen improvements in harbor infrastructure, yet there is still a need for additional space for commercial operations, especially for the town's lobster fishery. In particular, on-shore space is needed to store equipment and to load and unload supplies, charter guests, and employees. On the water, space is needed to dock or moor vessels, grow and process shellfish, and store gear.

From shellfishing off of Long Beach to fishing off of the breakwater, recreational fishing is also an important activity in Plymouth Harbor. As water quality improves in the Harbor, the Town will work with the Division of Marine Fisheries to open new areas to shellfishing.

A relatively new use of the town's waters, many residents engaged in shellfish aquaculture are working to fine-tune their operations in order to ensure that their activities are profitable and that their shellfish are grown and harvested according to federal, state, and municipal requirements. In particular, growers have expressed interest in using upwellers, which would allow them to purchase smaller seed at reduced costs and grow them to sizes appropriate for sale, as seed, or for release into the Harbor. On-water processing platforms could potentially house upwellers and would help protect against theft, weather, and disease. On-water platforms can also provide a work platform and help growers meet the shading and icing requirements to protect against vibrio bacteria. Due to human health risks associated with vibrio that thrive in warm water, the State requires that market-bound oysters taken from Plymouth Harbor be shaded against direct exposure to sunlight and adequately iced "within two hours of time of harvest or exposure, or prior to leaving the point of landing, whichever occurs first."[60,61] During summer months (July 1-Setember 15), the time allowed for icing drops from two hours to one hour, meaning that icing often has to take place onboard the grower's vessel, which can significantly reduce the space available for other necessary activities.

Issues:

1. Water quality conditions limit the amount of space that can be used for harvesting wild shellfish and growing shellfish.
2. Additional infrastructure such as ice, launch sites, and floating processing platforms would facilitate meeting the icing and shading requirements to protect against vibrio.
3. Creating a local shellfishing organization would provide a new forum for discussion and advocacy.
4. Many people do not understand the benefits of local aquaculture – such as water filtration and local food and jobs.
5. Commercial fishing operations could benefit from additional infrastructure.

Recommendations:

Goal I: Increase aquaculture production in municipal waters

Objective I: Provide infrastructure to support aquaculture operations

Recommendation 1. Explore opportunities to develop launch sites for growers so that they can quickly access their grants

While some growers have vessels large enough to ice oysters onboard, others bring their oysters to shore for icing. Having access from Boundary Lane would significantly reduce the amount of time spent in transit to and from the grant site.

Funding:

[60] MA DMF. 2016. Massachusetts 2016 Vibrio parahaemolyticus (Vp) Control Plan. Online at: http://www.mass.gov/eea/docs/dfg/dmf/programsandprojects/2016-ma-vibrio-control-plan.pdf.
[61] 322CMR16

- Seaport Economic Council

Responsible parties:

- Plymouth Harbor Committee
- Quincy College, Plymouth

Recommendation 2. Develop a Shellfish Advisory Board

Appointed by the Board of Selectmen, the Shellfish Advisory Board would meet monthly to discuss relevant issues and activities, and would advise the Board of Selectmen on actions to ensure viable and sustainable shellfisheries and balanced activities in the Harbor. Representation on the Shellfish Advisory Board would include commercial and recreational wild harvesters as well as aquaculturists.

Funding:

- No additional funds necessary

Responsible parties:

- Board of Selectmen

Recommendation 3. Identify locations in the Harbor suitable for floating upwellers

Upwellers enable growers to purchase small, inexpensive seed, and grow it in a controlled environment until the animals reach a size appropriate for placement in the lease site. The areas in Plymouth Harbor most suitable for floating upwellers (*e.g.,* in deep enough water, protected from wind, easily accessible from a launch site) are currently identified as closed to shellfishing, including the use of upwellers, and are under state management. The Town would need to coordinate with the MA Division of Marine Fisheries to obtain management authority to license upwellers in these closed waters. Specifically, the Town would have to work with the Division of Marine Fisheries to develop and enforce a management plan for the closed area, ensuring that upwellers and any other activities complied with the provisions of the management plan.

Should upwellers be allowed within the closed portion of the Harbor, relocation sites and guidelines should be established and included in the management plan to minimize the impacts of storm events.

Funding:

- No additional funds necessary

Responsible parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs
- MA Division of Marine Fisheries
- Plymouth Conservation Commission
- U.S. Army Corps of Engineers

Recommendation 4. Explore opportunities for floating platforms upon which growers can process shellfish and store gear

Floating platforms would enable growers to store their equipment in a safe, convenient location and would provide protection from the weather as they processed their shellfish. Floating platforms would also provide shellfishermen with a convenient location to ice their catches if they are not able to make it back to land within the window required for vibrio management. Locations for platforms should take into consideration proximity to grant sites and launch areas, potential conflicts with other harbor uses, presence of natural resources, and exposure to wind and waves. Relocation sites for platforms in preparation for storm events should also be identified. Consideration should be given both to privately owned platforms and public platforms.

Funding:

- Lease holders

Responsible parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs
- MA DMF
- Plymouth Conservation Commission
- Army Corps of Engineers

Recommendation 5. Ensure that programming at the new T wharf accommodates aquaculture needs

As programming for the T wharf is finalized, ensure that growers have access to ice, fuel, dinghy space, and winches.

Funding:

- No additional funds necessary

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee
- Aquaculturists

Recommendation 6. Continue to engage with the Harbor stakeholders to ensure that aquaculture activities and practices minimize impacts to the environment and to other harbor users

Maintain open dialog with harbor users to understand aquaculture's impacts, if any, on other harbor users. Work with stakeholders to address any conflicts.

Funding:

- No additional funds necessary

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee

Objective II: Protect water quality for aquaculture purposes (See Water Quality Section for recommendations)

Objective III: Promote local aquaculture

Recommendation 1. Conduct educational activities to inform people about the benefits of aquaculture

Aquaculture provides a local source of jobs and food and the shellfish contribute to improved water quality by removing nutrients through their feeding process. Knowing about the benefits of aquaculture may help lower local opposition and may increase demand for the product. Educational activities could include public presentations, a shellfish festival, programs on local access television, articles in local papers and magazines, and information tables at public events.

Funding:

- MA Cultural Council Festivals Program (for seafood festival funding)
- Additional funding is not necessary to implement many other elements of the recommendation.

Responsible parties:

- Growers
- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs
- Plymouth Department of Economic Development and Tourism
- Quincy College, Plymouth

Recommendation 2. Develop partnerships between private businesses and shellfish growers to increase the visibility of aquaculture as a new industry in the Town

Private businesses such as marinas and restaurants have the opportunity to facilitate the growth of local aquaculture in many ways. For example, restaurants could promote locally grown shellfish and partner with growers to offer special events such as waterfront dinners featuring locally grown shellfish. Marinas and businesses could provide staging and storage areas for growers, and offer discounted slip rates. Efforts should be made to develop partnerships that are beneficial to both the growers and the private businesses.

Funding:

- Private businesses

Responsible parties:

- Growers
- Local businesses
- Plymouth Harbor Committee
- Plymouth Chamber of Commerce
- Plymouth Department of Economic Development and Tourism

Goal II: Maintain and improve charter boat businesses in the Harbor

Objective I: Improve infrastructure for charter fishing operations

Recommendation 1. Provide waterfront space for moored charter boats to advertise their services

In many harbors such as Nantucket and Hyannis harbors, having vessels at the docks allows charter boats to advertise and attract business. In Plymouth, however, most charter boats are moored in the Harbor, and business is generated through advertising and websites. The Town should provide means for shore-side advertising, such as informational brochures and waterfront kiosks, for those charter boats on moorings.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Charter boat companies

Responsible parties:

- Charter boat companies
- Plymouth Department of Economic Development and Tourism
- Plymouth Chamber of Commerce

Recommendation 2. Explore opportunities to increase access to power and water within the Harbor for charter boat use

The new wharf will provide improved access to water and power, however additional power and water opportunities should be incorporated into any new commercial dockage developed in the Harbor (e.g., a new marina).

Funding:

- The cost of power and water should be incorporated into the cost of any upgrade/construction projects

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3. Ensure adequate dinghy space for charter boat operations

In addition to providing dinghy space at the T wharf, the Town should consider other locations for secure dinghy storage dedicated to charter boat use. Options include the new floating docks near the old ramp, increasing dinghy storage at the State Pier, and creating dinghy storage with the construction of any new dockage (e.g., a new marina).

Funding:

- Seaport Economic Council

Responsible parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

Goal III: Ensure that harbor activities support local commercial and recreational fishing activity

Objective I: Improve infrastructure to meet the needs of the commercial and recreational fisheries

Recommendation 1. Increase the amount of dockage available for use by commercial fishermen

Commercial fishermen operating out of Plymouth Harbor would benefit from additional berthing space. The new wharf will provide dockage for several boats, however additional dockage options should be explored such as dockage associated with a new marina and additional moorings associated with any expansion of the mooring field. Additionally, dinghy storage should be accommodated at the new floating docks near the reconstructed wharf and at any new dockage facility (e.g., a marina) and dinghy storage should be increased at the State Pier.

Funding:

- Seaport Economic Council

Responsible parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs
- Lobstermen's Association

Recommendation 2. Consider developing a strategy for management of the mooring fields and waiting list that takes into consideration the specific needs of the commercial fishing industry

The Town currently allocates moorings based on the order in which it receives an application and the availability of space appropriate for the specific requirements of a boat. In accordance with 310 CMR §9.07(2), the Town is allowed to consider managing its mooring waiting list based on the purpose of the vessel (e.g., commercial or recreational), the date of application, and/or the physical characteristics of the vessel (e.g., length and draft). The Town should re-examine its mooring allocation process to determine whether or not it adequately accommodates the needs of the commercial fishing industry. In particular, the Town may look to identify a dedicated commercial mooring area and manage the waiting list in a way that gives preference to commercial users in that area.

Funding: No additional funding is necessary to implement this recommendation.

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3. Identify locations in the Harbor where lobsters could be live-stored by wholesalers until ready for market

Such storage could include on-water storage (e.g., lobster cars), but consideration would need to be given to water temperature as well as to the security of the lobster car and the potential impacts on other harbor users. Other options include developing land-based storage sites. Though not a requirement, access to sea water would help the land-based sites maintain water chemistry conditions optimal for live-storage.

Funding:

- Seaport Economic Council

Responsible parties:

- Lobstermen's Association

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

Recommendation 4. Identify potential locations for a local lobster processing facility

A commercial lobster processing facility in Plymouth should be considered. Possible locations include Cordage Park and Plymouth Boat Yard.

Funding:

- This would be funded by a private business

Responsible parties:

- Private business
- Lobstermen's Association
- Plymouth Harbor Committee

Recommendation 5. Consider securing winter storage for commercial fishermen at Stephen's Field

Stephen's Field is currently undergoing re-design. Commercial fishermen should work with the re-design committee to identify areas appropriate for winter gear storage that would be compatible with other uses. As part of that, consideration should be given to fees associated with storage. Those fees could be used for park maintenance and improvement.

Funding: No additional funding is necessary to implement this recommendation.

Responsible Parties:

- Stephen's Field Committee
- Commercial Fishermen
- Plymouth Harbor Committee

Recommendation 6. Improve ramp access for commercial fishermen

If renovated, the Town boat ramp could provide a place for commercial fishermen to launch their vessels and offload their catch and gear. This would reduce their wait-time and also alleviate congestion at the state boat ramp. Additional ramp-related improvements and expansions should be made at Nelson Park and Stephen's Field to increase suitable launch sites for commercial fishing purposes.

Funding:

- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 7. Expand the designated commercial parking area to include spaces near the Town boat ramp

Limited designated parking for commercial fishermen already exists near the old ramp. Additional spaces could be reserved at the parking lot for the state ramp. An assessment of parking needs should be conducted prior to creating reserved spaces to ensure that the number of spaces reserved is adequate.

Funding:

- Plymouth Growth and Development Corporation

Responsible Parties:

- Plymouth Growth and Development Corporation

Recommendation 8. Designate areas for loading and unloading of people and gear for commercial and recreational fishing

The parking lot at the state ramp provides access to the ramp and would be one place to consider adding loading and unloading zones. Additionally, if floating docks are placed in the Harbor, with gangway access to Water Street, a designated loading and unloading space would provide access for those on the floating docks.

Funding: No additional funds are needed to implement this recommendation

Responsible Parties:

- Plymouth Growth and Development Corporation
- Department of Public Works

Recommendation 9. Provide improved commercial access to amenities including fuel, ice, wash-downs, and winches

Ensure that programming of the new wharf includes access to winches and space for wash-downs for commercial fishermen. Explore opportunities to place ice on the new wharf as well. Consider the feasibility of a publicly or privately-run water barge and fuel barge to service the Harbor.

Funding:

- Seaport Economic Council

Responsible parties:

- Commercial Fishermen
- Plymouth Department of Planning and Development
- Plymouth Department of Marine and Environmental Affairs

Objective II: Promote the local fishing industry as an attraction

Recommendation 1. Explore opportunities to highlight local commercial fisheries as a key feature of the Harbor

There are several ways to promote the local commercial fishing industry while attracting visitors to the Harbor. For example, as elements of the T wharf, the waterfront promenade, and other waterfront locations are planned, efforts should be made to ensure visual access to commercial fishing activities such as the unloading of catches. Additionally, harbor festivals including vessel tours, “meet a fisherman” opportunities, and preparation of locally landed seafood will help promote this aspect of the working waterfront as part of the harbor’s character while building awareness of the importance of the local commercial fishing fleet. (See Tourism Section for more detailed recommendations.)

Funding:

- No additional funds necessary

Responsible parties:

- Commercial Fishermen
- Plymouth Department of Planning and Development
- Plymouth Chamber of Commerce
- Plymouth Department of Economic Development and Tourism

5.6 Natural Resources

Both in and around the planning area, natural resources provide many different functions including contributing to the area's scenic beauty, providing habitat for marine and coastal wildlife – some of which are commercially and recreationally significant to the region, buffering against the impacts of storm events, removing pollutants and nutrients from the water column, and serving as a food source for marine and coastal wildlife as well as humans.

Plymouth has done a great deal of work to protect its natural resources, including efforts to improve diadromous fish spawning habitat through the removal of the Billington Street, Plymco, and Off Billington Street dams, the lowering of the Water Street Dam, and improvements of the fish ladders at Jenny Grist Mill and Newfield Street Dam. Plymouth has also worked to protect rare, threatened, and endangered species – most noticeably the shore birds on Long Beach through its management of access; and has worked on several projects to improve water quality, including securing a No Discharge Zone designation and the completion of multiple stormwater remediation projects. Protecting and restoring Plymouth's natural resources, however, will require ongoing attention to further improve water quality; continue to protect rare, threatened, and endangered species and their habitats; protect dwindling eelgrass resources; work to prevent the spread of invasive species; and ensure that migratory fish runs are functioning adequately. In addition to the protection, restoration, and maintenance of natural resources in Plymouth, the Town is also currently dealing with an increase in the local seal population, which attracts great white sharks. The Town has developed a shark sighting protocol to minimize the risk to the public.

Issues

1. A recent report by the Division of Marine Fisheries noted significant thinning and loss of eelgrass beds in Plymouth Harbor and the larger embayment system that includes Kingston and Duxbury bays. Exact causes of thinning and loss are unknown, and more information is needed to understand the fate of eelgrass in the area; however, DMF identified degrading environmental conditions (*e.g.,* water quality) as a likely driving factor, with plants further stressed by increasing water temperature. The report also notes potential impacts from human uses of the area such as boating, moorings, aquaculture activities.
2. Monitoring conducted at the town dock and Brewers Marine by the North and South Rivers Watershed Association and the Massachusetts Aquatic Invasive Species Program identified twelve invasive species common to the area. They include: skeleton shrimp, European green crab, Asian shore crab, European sea quirt, green fleece, orange striped anemone, bread crumb sponge, filamentous red algae, colonial tunicate, club tunicate, sheath tunicate, and star tunicate. The control of invasive species is important for many reasons including ensuring that native species are not displaced by non-native species.

3. Anadromous fish are an important cultural and natural resource, and their migratory paths should be maintained and improved, where appropriate.
4. Increases in grey seal populations are attracting sharks to the area, which impacts beach goers and users of small recreational vessels (e.g., kayaks, paddle boards).
5. Development in and around the Harbor has the potential to degrade the area's natural resources.

Recommendations

Goal I: Maintain and restore the town's natural resources

Objective I: Preserve and restore habitats throughout the planning area

Recommendation 1. Continue efforts to restore and monitor diadromous fish runs

The Town has already restored significant fish runs on Town Brook and Eel River. These sites should continue to be inspected to ensure that they remain functional. As part of that, and to collect information on the local migratory fish populations, volunteer counts should be continued on Town Brook and expanded to include Eel River.

Funding:

- Grants such as those offered by the Massachusetts Department of Ecological Restoration and the Massachusetts Environmental trust
- Private fundraising efforts from donors and sponsors

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Local volunteers

Recommendation 2. Continue to minimize impacts to eelgrass beds when siting activities in the Harbor

Boat moorings and aquaculture activities can have impacts on eelgrass beds. The Town should continue to allow boat mooring and aquaculture operations only in areas without eelgrass, and should also consider avoiding the siting of these activities in historic beds as well. If avoidance is not possible, consider the use of conservation moorings, which are designed to reduce contact between the mooring tackle and the sea floor. If conservation moorings are used, ensure that they are properly installed and maintained in order to be effective both in terms of securing vessels and protecting the benthic habitat.

Funding:

- No additional funds required at this time

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- U.S. Army Corps of Engineers
- MA DMF

Recommendation 3. Minimize damage to eelgrass from boating activity

Boating activity in the Harbor and surrounding areas can cause damage to eelgrass beds. Specifically, damage occurs when boats drive through eelgrass and make contact with the beds, and when boats anchor or moor in the eelgrass. The Town should work with local boating facilities to educate boaters about the locations of eelgrass and provide guidance on how to minimize their impacts on eelgrass beds. Examples include information on the town website, maps and signage at boat ramps, emails to customers of local boating facilities, and educational programs offered throughout the year. The Town should also consider using eco-friendly mooring systems (e.g. conservation rodes, mooring blocks with floats to accommodate more than one vessel) near eelgrass resources. Care should be taken to ensure that alternative mooring strategies do not shade out eelgrass.

Funding:

- Plymouth Waterways Fund

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Local boating facilities

Recommendation 4. Continue to ensure that impacts to benthic habitat are considered when decisions are made regarding activities that could have a negative impact on the sea floor

Plymouth harbor's seafloor serves as foraging, spawning, and nursery habitat for a variety of fish, crabs, and shellfish. Construction activities, boating activities, stormwater runoff, and nutrient pollution are some of the potential threats to benthic habitats.

Funding:

- Grants to reduce stormwater include the Coastal Pollution Remediation funding from MA CZM, as well as their Design of Stormwater Infrastructure Retrofits Grants program. Additionally a new stormwater funding opportunity is expected to be offered by the MA Clean Energy Center in the coming months. Many of the other strategies to reduce impact to the benthic habitat can be folded into the cost of a specific project or require no additional funds.

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Conservation Commission
- Plymouth Department of Public Works
- Watershed Organizations

Recommendation 5. Identify restoration projects that could be used as mitigation for other activities around the Harbor

Potential options for mitigation include eelgrass plantings, beach nourishment, shellfish plantings, and stormwater projects. The Town should develop and prioritize a list to use as a reference when a project is required to conduct mitigation.

Funding:

- Mass Bays National Estuary Program's Health Estuaries Grant Program

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Conservation Commission

Recommendation 6. Acquire strategic parcels by fee or easement to protect and improve natural resource features such as water quality and habitat connectivity

The Town should look to acquire key parcels, as appropriate, to preserve and enhance natural resources such as water quality and habitat, consistent with the land conservation provision of the Community Preservation Act.

Funding:

- Community Preservation Act Funds

Responsible Parties:

- Community Preservation Committee
- Members of the general public
- Private landowners

Objective II: Monitor and prevent invasive species

Recommendation 1. Continue to support invasive species monitoring in town waters and take measures to minimize the spread of invasive species

Continue to allow the North and South River Watershed Association and the Massachusetts Aquatic Invasive Species Program to monitor for invasive species at the town dock and at Brewer's Marine.

Funding: No additional funds are required to implement this recommendation

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Brewer's Marine

Recommendation 2. Place informational signage at boat ramps to educate users about the importance of taking measures to prevent the spread of invasive species

Specifically, boaters should be asked to check their boats, trailers, and fishing equipment for invasive species before and after use; clean any mud, plants, or animals off the boat or equipment before transporting the boat or equipment; drain all vessel compartments that can hold water (live wells, bait wells, bilge areas); and dry vessels, trailers, and other gear before using in another waterbody. The following examples of signs from New York may serve as models for Plymouth: http://www.dec.ny.gov/outdoor/85939.html

Funding:

- Massachusetts Environmental Trust

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3. Install invasive species disposal stations at the state and town ramps as well as at Steven's Field and Nelson Memorial Park

See: http://www.dec.ny.gov/animals/50626.html for an example of a simple disposal station.

Funding:

- The construction and installation of these boxes is low-cost and could be included as part of a grant to the Massachusetts Environmental Trust. Maintenance of the boxes would be low, and could be incorporated into the duties of existing staff members.

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Goal II: Develop an improved understanding of the town's natural resources

Objective I: Engage in and support research projects involving local natural resources

Recommendation 1. Conduct research to understand the potential impacts of dredging on oyster beds and eelgrass resources

Dredging projects disturb sediment, which can lead to increased turbidity in the water column and the resuspension of contaminants. While dredging is typically conducted during times designed to minimize impacts on living resources, non-mobile resources such as oyster and eelgrass beds, can be impacted by dredging activity regardless of when it is conducted. Before embarking on a dredging project, the Town should identify eelgrass and oyster beds in the area and conduct research to determine potential impacts and mitigation strategies.

Funding:

- MassBays Healthy Estuaries Grant Program

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Massachusetts Division of Marine Fisheries

Recommendation 2. Continue to partner to gather data on sharks

The current shark buoy system in Plymouth is designed to record the presence of sharks and other species tagged by DMF. The data are stored and collected every few weeks, providing important information about the frequency and timing of sharks in Plymouth waters. This system, however, was not designed to provide important real-time information that could be used to notify safety personnel of the presence of sharks near recreational areas. The technology for real-time shark monitoring is available but costly. The Town should consider securing funds to purchase or develop buoys that can provide real-time data and alerts about the presence of sharks.

Funding:

- Donations gathered through fund raising events such as an "adopt-a-buoy" campaign or a raffle to participate in a shark tagging expedition

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

- Massachusetts Division of Marine Fisheries
- Commercial enterprises such as Optus and their "clever buoy" system
- Academics, such as the Coastal Environmental Sensing Network at the University of Massachusetts Boston, who may be able to build less expensive monitoring buoys than those commercially available today

Recommendation 3. Explore opportunities to support a research program to understand the local seal population

The research project would focus on developing estimates of seal populations and identifying and monitoring haul out and feeding areas. This information would be used, in conjunction with the data gathered on sharks, to better understand the connection between seals and sharks, and to more accurately assess the risks posed by the increased seal population. Of particular interest is the growth of the haul-out site at Brown's Bank. The program could involve volunteer researchers in order to keep down the costs and build local interest in the issue. The NOAA Fishery Service study conducted on Muskeget and Monomoy Islands may serve as a good model for a Plymouth-based study. (See: http://www.nefsc.noaa.gov/press_release/pr2016/scispot/ss1602/ for a description of the NOAA study.)

Funding:

- Depending on the scale and structure of the research program, The Atlantic White Shark Conservancy could serve as a model for funding. Most of their funds are from local companies, private donations, and events.

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Academic or research institution
- MA Division of Marine Fisheries
- Local volunteers

Recommendation 4. Support the Division of Marine Fisheries as they look to collect additional information about the potential causes of recent eelgrass loss in the area

They data needs identified by DMF include routine eelgrass surveys; the identification of sites for potential restoration; and monitoring of water quality, light and sediment sulfide conditions in the embayment, wasting disease, epiphyte load, stem density, nitrogen content, and carbohydrates. The Town could assist with on-water transportation and may consider collecting additional water quality data to support DMF's research.

Funding:

- MA Environmental Trust

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- MA Division of Marine Fisheries

Goal III: Foster an appreciation of the town's natural resources that contributes to their protection

Objective I: Provide opportunities for people to learn more about and care for their local natural resources

Recommendation 1. Continue to promote timely issues as well as the town's work on natural resource protection and restoration through the town website, local media, and social media

The existing website for the town's Department of Marine and Environmental Affairs already contains a "News" section. This resources should continue to be used to highlight recent projects as well as issues of concern. Additionally, efforts to inform the public through local newspapers, the local public access television programs, and social media should be maintained. Once the Board of Selectmen has finalized the town's social media policy, the Department of Marine and Environmental Affairs, and the Harbormaster's Office in particular, should consider developing new Facebook pages to notify people about harbor-related activities such as special events and construction updates, and natural-resource-related information such as water quality updates and shark safety tips.

Funding: No additional funding required

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Promote Plymouth as a destination for eco-tourists

Building on the efforts of "Explore Natural Plymouth", the Town should encourage eco-tourism opportunities. Local events could highlight the town's harbor and beach resources, and could include land-based walking tours as well as water-based tours (e.g., large charter boats, kayak tours). While some of these opportunities could be supported by NGOs and the Town, eco-tours could also be provided by a local business or businesses and might use Steven's Field or Nelson Memorial Park as staging and launching sites.

Funding:

- The cost of programs could be built into the fee for participation

Responsible parties:

- Plymouth Chamber of Commerce
- Local businesses and NGOs, including those involved in Explore Natural Plymouth

Recommendation 3. Encourage behaviors that reduce the amount of trash in the ocean and coastal environment

Trash that isn't properly disposed of can be dropped, washed, or blown into the water. Providing trash receptacles and signage about the dangers of marine debris can help reduce the amount of trash entering the ocean and coastal environment. Some specific locations for improved trash disposal include at each boat launch site, at all waterfront parks, and along the trail connecting Cordage Park to downtown. In addition to encouraging proper trash disposal, efforts should be made to enforce the town's plastic bag ban.

Funding:

There are a variety of funding opportunities for larger projects that could include this education and prevention component. If the Town wished to make this recommendation a part of a larger project, potential funding opportunities include

- NOAA's Community-based Removal Grant program
- NOAA's Marine Debris Prevention through Education and Outreach opportunity
- Massachusetts Environmental Trust's General Grants program.

Responsible Parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

Recommendation 4. Provide important water conservation information to residents

Water conservation is important at all times, but especially during droughts. Residents should be encouraged to take conservation measures such as reduced lawn watering, planting native drought-tolerant species, and collecting water in rain barrels. Education should be timely and should be provided through multiple channels including public lectures, signage along streets, and articles in the local newspaper. The Town should model water conservation strategies by taking steps such as installing rain barrels, water-efficient toilets and faucets; limiting watering on town-owned property; and planting drought-resistant native plants on town-owned property.

Funding:

- The costs associated with conservation-related upgrades to facilities should be incorporated into project budgets
- Public education activities could be low-cost and accommodated with existing budgets. Larger projects could receive funding from sources such as the Massachusetts Environmental Trust.

Responsible Parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

Recommendation 5. Increase public awareness of sharks, including their role in the ecosystem and ways to minimize personal risk

As part of this, increase the number of subscribers to social media in order to inform people about shark sightings in a timely manner. Recruitment of subscribers could be done through emails to beach permit holders and mooring holders, announcements in the local newspapers, signage at beaches, and recruitment through other social media sites.

Funding:

- No funding necessary to implement this recommendation

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

5.7 Water Quality

Water quality in Plymouth Harbor is of paramount importance to Town. Both wild shellfishing and aquaculture within the Harbor depend on clean water to operate. Furthermore, water quality is the foundation upon which much of the harbor's other marine life depends. In general, water quality has

been linked to the decline in eelgrass. The Town is active in improving water quality, having implemented many measures to reduce road runoff and address sewer problems such as the recent sewer breaks. The Town is also exploring the possibility of making changes to operations at the waste water treatment facility which currently discharges first to the ocean outfall, and second to a land-based infiltration bed. By reversing the order of discharge, the Town could greatly reduce the amount of treated effluent released into the Harbor while it explores additional opportunities. A study of the outfall as it relates to harbor circulation, expected in the spring of 2017, will provide important information as the Town considers next steps. The Town has also worked with the US Environmental Protection Agency to become a No Discharge Zone, which means that vessels cannot discharge their waste into the Harbor. Despite these measures, additional efforts are necessary in order to ensure that water quality in the Harbor can meet regulatory requirements and support the marine life so important to the town's local economy and natural resources.

Issues:

1. Current operation of the waste water treatment may be negatively impacting water quality in the Harbor.
2. The natural resources within the Harbor (e.g., eelgrass and shellfish) are sensitive to water quality and can be impacted by dredging, road runoff, sewer breaks, and other sources of contamination.
3. Education about and enforcement of the No Discharge Zone needs to be increased.

Goal I: Improve water quality in Plymouth

Objective I: Maintain and improve water quality to support shellfishing and marine life

Recommendation 1. Minimize the impact of dredging on water quality

During dredging, contaminants in the sediment can be released and the sediment itself can impair functions of sedentary marine life. Impacts may be minimized through mitigation (specifically, the development of new habitat and the relocation of affected marine life), careful timing of dredging activities, and the use of advanced techniques and equipment including monitoring and modelling technologies.

Funding:

- Seaport Economic Council

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Army Corps of Engineers
- MA Division of Marine Fisheries

Recommendation 2. Continue to explore the opportunity to change the flow pattern at the waste water treatment facility

The current NPDES permit for the waste water treatment facility allows for an annual average discharge of 1.75 MGD via the Plymouth Harbor outfall, located on the Harbor floor just south of Goose Point Channel, with the remaining 1.25 MGD capacity discharged into the facility's groundwater infiltration basins. The Town is working with the MA Division of Marine Fisheries to conduct a dye study to, in part, determine the fate of the discharged effluent. Additionally, the

Town has begun the process of exploring whether or not the order of discharges could be reversed, with the first discharge to the infiltration beds, and the second discharge to the Harbor outfall. Such a reversal, and other considerations such as limiting outfall release during warm weather, could potentially improve water quality, allowing the opening of new shellfish areas and possibly extending the season. The expansion of shellfishing grounds and seasons would need to be approved by the Division of Marine Fisheries. Coordination with DMF should begin as soon as possible.

Funding:

- Massachusetts Waterfront Infrastructure Assessment and Planning Grants

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs
- US Environmental Protection Agency
- MA Department of Environmental Protection

Recommendation 3. Explore opportunities to modify the discharge to the Harbor from the wastewater treatment facility

Reversing the discharge at the current waste water treatment facility should be a temporary strategy to improve water quality as the Town explores options to modify the existing waste water treatment facility. An alternative facility with more advanced treatment technologies and 100% discharge to land should be considered, as well as options to upgrade the technologies at the current facility, including extending the outfall pipe to a deeper site with greater tidal exchange. The forthcoming outfall study (expected in spring 2017) should be referenced to understand the impacts of the waste water treatment facility.

Funding:

- Massachusetts Waterfront Infrastructure Assessment and Planning Grants

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs
- US Environmental Protection Agency
- MA Department of Environmental Protection

Recommendation 4. Encourage compliance with No Discharge Area requirements

The release of raw sewage into the Harbor can be harmful to aquaculture operations and can impact public health. While in the No Discharge Zone, boaters are required to secure their Type I, II or III device "in a manner which prevents discharge of treated or untreated sewage." [62] Options for securing a Type I or II device include removing the handle of the seacock or padlocking/wire-tying it in the closed position; or locking access to the toilets themselves. Options for securing a Type III device include, "(1) Closing each valve leading to an overboard

[62] 33 CFR 159.7(b)-(c)

discharge and removing the handle; (2) Padlocking each valve leading to an overboard discharge in the closed position; or (3) Using a non-releasable wire-tie to hold each valve leading to an overboard discharge in the closed position."[63] The Town and local boating facilities should promote awareness about these requirements through signage, email reminders, websites, and conversations with boaters. Inspections of devices should be conducted by Harbormasters as appropriate.

Funding:

- No additional funds necessary

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- Marinas and yacht club
- Plymouth Harbor Committee

Objective II: Minimize impacts of potential sewer breaks

Recommendation 1. Develop response plans to minimize the natural resource impacts caused by a sewer break

Efforts should be made to identify important natural resources and determine potential impacts that a sewer break could have on those resources. Based on that assessment of potential impacts, response plans should be developed for various scenarios related to sewer breaks. Existing response plans should be used as models.

Funding:

- Massachusetts Waterfront Infrastructure Assessment and Planning Grants

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

Objective III: Reduce water quality impairments related to run-off

Recommendation 1. Develop an inventory and assessment of outfall pipes draining to the Harbor and identify upgrades and improvements at each site to reduce the flow of un-treated stormwater to the Harbor

The Town may wish to prioritize this list and use it as the basis for applying for grant funds.

Funding:

- 604b Grant Program for Water Quality Management Planning
- Section 319 Nonpoint Source Competitive Grant Program

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

[63] *Ibid.*

Recommendation 2. Extend the sewer line to include commercial businesses along Warren Ave.

Funding:

- Rate payer fees and taxes
- Low-interest loans

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

Recommendation 3. Ensure that any future development and re-development projects include storm water upgrades and other measures to improve water quality

Examples of storm water upgrades include the installation of bioswales, rain gardens, and constructed wetlands. Other measures to improve water quality in appropriate locations might include minimizing impervious surfaces through green roofs and permeable pavers and using native plantings that minimize the use of fertilizers and pesticides.

Funding:

- Section 319 Nonpoint Source Competitive Grant Program
- The costs of these improvements can be incorporated into project budgets

Responsible parties:

- Plymouth Department of Public Works
- Plymouth Department of Marine and Environmental Affairs

Objective IV: Increase public education

Recommendation 1. Conduct public education and outreach regarding the state of water quality in Plymouth Harbor and causes and impacts of impairments

Outreach could include making water quality results available online and giving updates at meetings including those of the Board of Selectmen and the Harbor Committee. Additional outreach on causes of impairments and impacts could include presentations to NGOs and other interested groups, appearances on a local public access television program, and brochures at the harbormaster building, the library, and other public facilities. Information about potential impairments and impacts should include information to encourage sustainable behaviors such as the use of pervious pavers, limits on fertilizer use, and the installation of rain gardens.

Funding:

- Massachusetts Environmental Trust

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Objective V: Continue to collect water quality data to support water quality efforts

Recommendation 1. Continue municipal water quality data collection efforts

Municipal data collection, four times a year between June and September, should continue as part of the permit requirements for the wastewater treatment facility. When the EPA's NPDES

permit is up for renewal in five years, work with the EPA and the Massachusetts Department of Environmental Protection to coordinate water quality monitoring efforts in a way that saves time and money while providing the most useful data.

Funding:

- No additional funds needed at this time

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

5.8 Harbor Safety

Safety is a priority in Plymouth Harbor. The harbor experiences congestion, especially during the summer months of June, July, and August when the boating population is the largest. Recreational boaters, commercial fishermen, jet skiers, kayakers, stand-up paddle boarders, ferries, small cruise ships, and party/charter boats are among the many users of Plymouth Harbor; and the state boat ramp is the second busiest in the Commonwealth. The congestion within the Harbor creates safety hazards, as many different user groups operate within the same space.

In addition to congestion, boaters transiting the federal channel at high speeds may create a wake which can overturn nearby kayaks and stand-up paddleboards and disrupt other boats.

Additionally, if not familiar with the Harbor, boaters may ground their vessels or damage equipment in shallow areas.

Plymouth Harbor has specific systems in place to enhance the safety of the Harbor, and well-trained Harbormasters patrol the area, conducting safety inspections, educating boaters, enforcing boating regulations, and responding to emergencies. That said, more proactive measures can be implemented to enhance safety within the Harbor.

Issues:

1. Current levels of congestion present a safety hazard (*e.g.,* conflicts between motorized and non-motorized vessels).
2. The harbor contains a variety of users (*e.g.,* kayakers, recreational boaters, ferries) and some uses may interfere with or potentially endanger other uses (*e.g.,* the wake from larger boats may tip kayaks or stand-up paddleboards).
3. Boaters do not always obey headway speed restrictions in the Harbor and in blind turns such as that by the jetty bridge.
4. Some renters of jet skis and paddle sports equipment lack boating experience and knowledge of local harbor conditions, potentially creating unsafe conditions including, accidents, strandings, groundings, capsizings/swampings, and people getting lost.
5. People using the Harbor, especially those engaged in paddle sport activities, are sometimes un-prepared for the Harbor/ocean environment and misjudge conditions such as tide, wind, boat traffic, and wave action, falling victim to conditions.
6. Some boaters do not understand the carriage requirements of safety equipment, rules, regulations, and rules of the road due to lack of experience and knowledge.
7. Boats can break free from moorings during wind events, possibly damaging other boats/ property, causing fuel spills, or restricting navigation.

Recommendations:

Goal I: To provide a boating environment that promotes safety and navigation among the multiple users within Plymouth Harbor.

Objective I: To improve waterfront infrastructure and support patrol functions, thereby enhancing harbor safety

Recommendation 1. Install additional floats to alleviate space conflicts and ease daily operations

Floats are needed at the new wharf for loading and unloading, at the boat ramp for dinghies, and at the State Pier.

Funding:

- Seaport Economic Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee

Recommendation 2. Continue to work with the Coast Guard to ensure that aids to navigation are adequate, and continue to compliment the federal aids by adding private aids to navigation where needed

Boaters in Plymouth Harbor rely on federal aids to navigation – installed, managed, and maintained by the U.S. Coast Guard – as well as private aids to navigation in order to safely transit the Harbor. The Town should work with harbor users to review existing aids and identify any areas within the Harbor that need additional navigational aids.

Funding:

- Federal aids are the responsibility of the Coast Guard
- Plymouth Waterways Funds and funds from private boating facilities could be used to establish private aids to navigation

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- U.S. Coast Guard

Recommendation 3. Continue to maintain security within the Harbor

Harbormasters should continue to patrol speed and potential interaction between user groups and ensure that vessels are obeying speed limits. Additionally, Harbormasters are currently using video cameras to monitor the security of the docks. Harbormasters should ensure that these video cameras adequately cover all areas that need security monitoring, and should encourage private businesses to install security cameras as appropriate.

Funding:

- Department of Homeland Security Port Security Grants

Responsible Parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

Recommendation 4. Address potential hazards to navigation

The Town should consider actions and rules that better manage and enforce any navigational hazards, including unauthorized moorings, unpermitted structures, and lobster pots obstructing safe passage in the channel. In particular, the Town should develop a by-law to address unpermitted/unauthorized structures.

Funding:

- Plymouth Waterways Fund

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 5. Research the potential for a wave attenuator that could dampen impacts from storm surges, dangerous high tides, wakes, and waves

Investigate if the attenuator(s) could provide seasonal dockage, or provide padding/buffer to minimize damage to vessels. Potential locations for wave attenuators could include the jetty or between the channel and the mooring field.

Funding:

- Coastal Resilience Grant Program, Massachusetts Office of Coastal Zone Management

Responsible Parties:

- Plymouth Harbor Committee
- Plymouth Department of Marine and Environmental Affairs

Objective II: To accommodate and balance the various users of Plymouth Harbor, thereby enhancing harbor safety.

Recommendation 1. Improve safety for those using rental equipment in the Harbor by increasing safety briefings and professionally guided tours and providing guidance on when rented paddle craft are allowed outside of the mooring fields/channel

Mandatory safety briefing should be provided by business owners and include areas that are off-limits to users because of potential hazards, boat traffic, and sensitive natural resources (e.g., eelgrass). Additionally, businesses should offer more guided tours by staff familiar with local harbor conditions and potential hazards. Lastly, efforts should be made to establish guidelines, and perhaps a notification system, to warn rental providers and users of unsafe harbor conditions such as weather.

Funding: No funding is needed; however if guides are hired, the costs can be incorporated into rental fees.

Responsible Parties:

- Business owners in Plymouth

Recommendation 2. Ensure that any efforts to increase transient use of Plymouth Harbor do not negatively impact other users of the Harbor

Consider clustering transient moorings in dedicated areas, and ensure that additional services (e.g., fuel, ice, water, power) are adjusted as harbor capacity increases. Look to the new wharf and the town boat ramps to service the needs of commercial fishermen in order to alleviate some congestion stemming from an increase in transient use of the Harbor.

Funding:

- Plymouth Waterways Fund
- Private businesses

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Harbor Committee

Objective III: Increase signage providing information on (1) the risks associated with paddlesports/boating, (2) required safety gear, and (3) other rules and regulations.

Recommendation 1. Post signage specifically for users of non-motorized vessels at Steven's and Nelson's Field

Non-motorized vessels, *e.g.,* kayaks, canoes and paddleboards, are readily available and very popular for new boaters. Understanding the rules, regulations, safety concerns and environmental hazards would help to educate people before they get underway.

Funding:

- No funding needed at this time

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Develop and disseminate a brochure to highlight safety issues and suggested routes for non-motorized craft

A brochure with suggested routes could enhance safety by directing unfamiliar harbor users to areas with minimal congestion and hazards. Including important emergency contact information and guidelines about weather conditions in the brochure can further improve safe boating.

Funding:

- Private companies could sponsor development and printing by being allowed to purchase advertising space on the brochure

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Private businesses renting boating equipment

Recommendation 3. Add "no wake" signs to the jetty bridge and near the boat ramp to increase awareness of the regulation for people that may be new to the Harbor

Funding:

- No funding needed at this time

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Objective IV: Increase boating safety through education

Recommendation 1. Provide additional opportunities for boater education

While the State does not have a requirement for boating education, Harbormasters teach boating safety courses for those that wish to better understand regulations, rules of the road, environmental hazards, emergencies on the water, etc. Harbormaster staff can increase the number of courses available in order to educate more boaters operating in Plymouth waters. Currently, private facilities are used for courses, sometimes making them difficult to schedule around other events. The forthcoming maritime center would provide space and availability to hold classes during optimal times and days, *i.e.,* weekends/ weeknights.

Additionally, support state efforts to make boater education mandatory.

Funding:

- Funding for the courses can be provided through course fees

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Objective V: Improve mooring safety

Recommendation 1.Maintain a list of town-approved mooring service providers and require boaters to use approved providers to service moorings

Moorings in Plymouth Harbor are privately held and most are service by a mooring service provider approved in Plymouth. Moorings in dis-repair are unsafe and can cause vessels to break free crashing into other boats, grounding or sinking causing a hazard to navigation, environmental damage and debris in the environment. Consider developing a regulation to require inspection by a town-approved entity.

Funding:

- No additional funding needed

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2.Improve efforts to increase awareness of regulations pertaining to mooring ownership i.e., a 3 year inspection is mandatory, not optional

Funding:

- No additional funding needed

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 3.Improve Harbormaster's tracking of mooring inspections to flag those moorings not in compliance, and require the owner to show proof of inspection prior to resuming use of the mooring

Currently, those service providers conducting mooring inspections typically report completed inspections to the Harbormasters. Work with those service providers to ensure timely reporting,

and encourage boaters to take a more active role in ensuring that inspections are completed and Harbormasters are notified.

Funding:

- No additional funds needed

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Mooring Inspectors
- Boaters

5.9 Climate Change

Climate change is being experienced locally in the form of increasing air and sea surface temperatures, higher sea levels, greater threats from storm events, and changes to commercially and recreationally significant marine species. Many of the impacts are gradual and some are not yet known or well understood, making this an important time to take measures to improve information about local impacts and protect the town's residents and resources. Recognition of the potential threats is important in long-range planning and design of waterfront infrastructure. The Town has received some funding to conduct nourishment projects, but additional work is needed to identify the impacts of sea level rise on local infrastructure and natural resources.

Issues:

1. While information about climate change and impacts is generally available for the regional based on large-scale modelling, there is little information about the specific impacts that climate change will have on Plymouth's natural resources and infrastructure.

Recommendations:

Goal I: Improve the town's ability to respond to climate change impacts

Objective I: Develop and foster a better understanding of the potential impacts of climate change in Plymouth and appropriate responses

Recommendation 1. Work with consultants to understand the potential impacts of climate change on harbor conditions

In particular, focus on (1) potential impacts that dredging might have in terms of exacerbating storm surge/wave height; (2) harbor impacts stemming from a breach in one of the local barrier beaches; (3) impacts of sea level rise and storm surge on local infrastructure; and (4) measures – such as a levee – that could be used to mitigate the impacts of climate change on the Harbor.

Funding:

- Coastal Resilience Grant Program, Massachusetts Office of Coastal Zone Management
- Regional Coastal Resilience Grants Program, NOAA

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs

Recommendation 2.Develop an education and outreach program designed to encourage the community to understand the potential impacts of climate change

This program could take many forms, including public talks, pieces in local media, outreach events at schools, educational signage in affected areas, and outreach to fishermen and shellfish growers. The program should take into consideration the results of any studies involving Plymouth and the region.

Funding:

- Coastal Resilience Grant Program, Massachusetts Office of Coastal Zone Management
- Regional Coastal Resilience Grants Program, NOAA

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- USGS

Recommendation 3. Consider potential climate change impacts when constructing or modifying infrastructure

As the Town considers projects to enhance its waterfront, it should do so in consultation with sea level rise maps and other relevant data in order to ensure that structures are designed to meet conditions projected throughout the life of the structure/project/facility.

Funding:

- Coastal Resilience Grant Program, Massachusetts Office of Coastal Zone Management

Responsible parties:

- Plymouth Department of Marine and Environmental Affairs
- USGS

Recommendation 4. Continue to participate in FEMA's Community Rating System

The Community Rating System allows Plymouth to take steps to protect against flooding while securing discounted federal flood insurance for local property owners. Its current activities have secured a 5% discount on federal flood insurance, and those activities should be continued.

Funding:

- Coastal Resilience Grant Program, Massachusetts Office of Coastal Zone Management
- Regional Coastal Resilience Grants Program, NOAA

Responsible parties:

- Plymouth Conservation Commission

5.10 Tourism and Education

Tourism is a $350 million dollar a year industry for Plymouth, with many people coming to enjoy the town's rich history and natural resources. Plymouth Rock, the *Mayflower II*, whale watches, lobster excursions, and Long Beach are just some of the key tourist attractions within the planning area. The Town's 400th Anniversary will also bring many people to town, and efforts are underway to use that opportunity to highlight several of Plymouth's features. These events and attractions are important for many reasons, including the fact that they create jobs and generate significant revenue for local businesses while providing opportunities for visitors to learn about the area's history, culture, and

environment. The Town works to promote Plymouth as a destination online and through other media. Special events are highlighted in various places including Destination Plymouth County's websites and on signs posted around the downtown area.

While tourism is well-developed in town, there are still opportunities to use the Harbor and its vast resources to draw people to Town and to the waterfront. For example, as an educational resource, Plymouth Harbor's natural environment is easily accessible from many areas and can be used to highlight various types of habitats such as barrier beaches and tidal flats; natural resources such as piping plovers and invasive species; and topics of current interest such as climate change impacts and erosion. While whale watches and fishing expeditions already capitalize on the harbor's resources for educational purposes, more effort should be made to highlight and utilize the Harbor as a living lab for educational opportunities. Additionally, visitors have enjoyed opportunities to observe and engage with fishermen in the past, and the redevelopment of the new wharf might provide opportunities to improve this experience for fishermen and visitors alike.

Much of Plymouth's existing tourism is based on people visiting by land, but the Harbor provides excellent opportunities for visitors to arrive by sea as well – either on their own vessels or on small cruises and charter boats. Vessel size at docks is limited to approximately 160 feet, and depth at docks is limited to approximately 5-6 feet, but dredging could increase the depth available at docks, and larger vessels could anchor in deeper water if services were available to transfer their passengers to town.

Issues:

1. Plymouth has not reached its potential as a tourist destination for those coming by boat.
2. The working waterfront in Plymouth is an under-utilized attraction.
3. The harbor is underutilized as an educational resource.

Recommendations:

See the recommendations in the Moorings and Transient Boating sections of this plan for information about increasing moorings and improving transient services as it relates to tourism; and see the Natural Resources section of this plan for information on eco-tourism opportunities.

Goal I: Increase tourism in the Harbor

Objective I: Elevate the Harbor as a destination for vessel-based tourism

Recommendation 1. Encourage small cruise ships and tall ships to use Plymouth Harbor as a port of call

Historically, Plymouth has hosted small cruise ships up to 160' feet and 6 feet in draft, but these visits have been infrequent – in part because the number of small cruise ships operating in New England that meet these size requirements is limited. Dredging and dock expansion projects should take into consideration the berthing needs of small cruise ships and tall ships, and additional marketing should be conducted to attract visits. In order to increase docking opportunities, work with the Department of Conservation and Recreation to improve programming along the State Pier to allow for overnight stays of cruise ships and tall ships.

Funding: No additional funds are needed to implement this recommendation. Dredging funds could be necessary and could come from the Seaport Economic Council.

Responsible Parties:

- Plymouth Department of Economic Development and Tourism

- Plymouth Area Chamber of Commerce
- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Encourage ferry day trips

The Plymouth to Provincetown ferry provides a wonderful opportunity to market Plymouth as a destination for those on the Cape. Efforts should be made to increase promotion of the ferry as a means to also visit Plymouth and adjust the schedule to offer more trip options – especially in coordination with special events in Plymouth.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Private business

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Captain John Whale Watching and Fishing Tours

Recommendation 3. Explore the possibility of a water taxi

For those who wish to experience the Harbor by water, but who do not have access to a vessel, a water taxi system would provide a means by which to see the Harbor while also getting to various destinations. Potential stops could include Cordage Park, Brown's Bank, Town Pier, the State Pier, and Long Beach. Efforts should be made to explore whether or not the taxi system could also serve as a launch service – especially after-hours – and whether or not demand exists for multiple taxis.

Funding:

- Private business

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Department of Marine and Environmental Affairs
- Private business

Recommendation 4.Explore opportunities to bring fishing tournaments to Plymouth

Fishing tournaments, including charity events, provide an opportunity to attract new visitors to the Harbor and increase local business as a result of the influx of potential shoppers, diners, and hotel guests. Efforts to bring fishing tournaments to the Harbor should take into consideration all aspects of the event, including location, publicity, and any potential conflicts associated with the species being fished.

Funding: Entrance fees and corporate sponsorship could be used to cover the cost of the tournament.

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Department of Marine and Environmental Affairs

- Private businesses

Recommendation 5. Promote Plymouth Harbor as a welcoming place to boat

Routinely review comments and feedback from the boating community, including reviews on Dockwa, in order to determine where the Department of Marine and Environmental Affairs can improve amenities, customer service, and/or image to ensure that the Department and harbor are welcoming to all boaters.

Funding: No additional funds are needed to implement this recommendation.

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs

Objective II: Develop opportunities to celebrate the Town's working waterfront

Recommendation 1. Develop new opportunities to celebrate the history of Plymouth's waterfront

In addition to the landing of the Pilgrim's, the Plymouth waterfront has a fascinating history in that includes Native American uses of the Harbor, whaling and fishing activities, trade, and industries such as the making of cordage. Opportunities to highlight these historical activities of the Harbor should be integrated into harbor signage, educational kiosks, and other programming along the waterfront. Plimoth Plantation and other historical sites around town should expand waterfront-related programming where feasible.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Plymouth Cultural Council

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Existing historical sites/programs

Recommendation 2. Encourage safe opportunities for members of the public to enjoy the working waterfront

Plymouth's working waterfront, and the commercial fishing activity in particular, attract visitors who enjoy watching fishing boats come and go and seeing fishermen unload their catches. With construction of the new wharf, it is important to provide visual access to the fishing activity in a way that is enjoyable for the visitor, but also allows fishermen to safely and efficiently offload their catches. Signage on the wharf should welcome visitors but clearly identify areas only accessible to commercial fishermen. Signage along the waterfront by Woods Seafood can also provide information about fishing in Plymouth and benches/chairs near Woods, the new harbormaster facility, and the town pier could provide seating for those who wish to watch the harbor's activity without walking onto the wharf. Additional seating areas could provide different perspectives of the harbor's activities, including along Water Street near the pavilion.

Funding:

- Plymouth Cultural Council

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Plymouth Department of Public Works
- Plymouth Bay Cultural District

Recommendation 3. Improve the blessing of the fleet celebration to draw more attention to the commercial fishing in Plymouth Harbor

Explore ways to increase community participation in the blessing of the fleet celebration. In addition to activities planned for past events, consider a road race (see http://narragansettlionsclub.com/sub_category_list.asp?category=16) or open water swim – the funds of which could be used for charitable purposes or to pay for programs and improvements in the Harbor, a seafood festival, a touch tank, a prize for the best decorated vessel, and a parade through downtown Plymouth. Consider timing the Blessing of the Fleet with the return of the *Mayflower II*.

Funding:

- Proceeds from the road race and seafood festival could be used to cover the costs of some of the celebration. Additional funding could come from event sponsors.
- Massachusetts Cultural Council Festivals Program
- Town of Plymouth Promotions Fund Grant Program
- Plymouth Cultural Council

Responsible Parties:

- Plymouth Lobstermen's Association
- Plymouth shellfishers
- Boating related companies such as Brewer's Marine, Plymouth Boat Yard, the Pier at Cordage
- Plymouth Yacht Club
- Plymouth residents
- Plymouth Department of Marine and Environmental Affairs

Recommendation 4. Promote the Town's commercial fishing industry, while providing additional advertising and income-generating opportunities for fishermen

Potential opportunities include events such as tours of oyster farms, seafood festivals, partnerships between companies to highlight locally caught seafood (for example, partnerships between Mayflower Brewing and local oyster growers to highlight the locally grown shellfish and locally brewed beers in the brewery's tasting room), and participating in the Plymouth Farmer's Market as a vendor or as part of their Culinary Insights program. Explore opportunities to establish food vendor opportunities (*e.g.,* a raw bar) on or near the town dock or town pier to highlight the local food landed in Plymouth. Work with the Department of Conservation and Recreation and other waterfront land-owners to identify similar opportunities elsewhere along the Harbor.

Funding:

- Massachusetts Cultural Council Festivals Program (for the seafood festival)
- Town of Plymouth Promotions Fund Grant Program
- Private businesses

Responsible Parties:

- Local businesses
- Plymouth Department of Economic Development and Tourism

Recommendation 5. Ensure that the waterfront is celebrated as part of the 400th anniversary

Create events that highlight the harbor's history as a working waterfront and showcase current uses of the Harbor, such as the local commercial fishing industry, fast-ferry, whale watching excursions, and harbor tours. As part of this, consider organizing a flotilla for the return of the *Mayflower II* – perhaps in conjunction with the Blessing of the Fleet event.

Funding:

- Massachusetts Cultural Council Festivals Program

Responsible Parties:

- Plymouth 400
- Private companies
- Plymouth Lobstermen's Association
- Plymouth Department of Marine and Environmental Affairs

Objective III: Improve the connection between downtown and the Harbor

Recommendation 1. Develop art exhibits that draw people from downtown to the Harbor and identify locations for both temporary and permanent art installations along the waterfront

The Town's Lobster Crawl is a good example of an activity which creates public art and encourages people to explore the downtown area, including the waterfront. Programs such as these should continue to be developed along with additional community art along the waterfront. With the development of the waterfront promenade, some potential sites include the park along Water Street at the end of Chilton Street and the area along the waterfront just north of the rotary at Town Wharf. Additional opportunities include near the breakwater at the state boat ramp parking lot, and in a potential landscaped area in the state pier parking lot.

Funding:

- Corporate sponsorship
- Plymouth Cultural Council

Responsible Parties:

- Plymouth Chamber of Commerce
- Plymouth Bay Cultural District
- Local companies
- Local artists

Recommendation 2. Install informational kiosks that include a list of events, a map, brochures, and important historical information related to the location of the kiosk

Kiosks should be located strategically, such as at the start of the bike path at Cordage Park, the town dock, the new wharf, the state boat ramp, Plymouth Rock, the *Mayflower II*, Nelson Park, the parking lot at Long Beach, near Brewster Gardens, and in downtown locations (e.g., Pilgrim Hall Museum and the Grist Mill). Where possible, include historical as well as current information at these kiosks, including activities such as educational program highlights, and ongoing research.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Plymouth Cultural Council

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Chamber of Commerce

Recommendation 3.Draw visitors to the waterfront with additional shopping opportunities

Consider opportunities to provide permanent or temporary/seasonal shopping opportunities along the Harbor. These could range from the development of small shops along new dockage in the Harbor to temporary stalls placed along the waterfront in locations such as Pilgrim Memorial State Park and along the Water Street Park near the rotary.

Funding:

- Town of Plymouth Promotions Fund Grant Program
- Private businesses

Responsible Parties:

- Plymouth Department of Economic Development and Tourism
- Plymouth Chamber of Commerce

Recommendation 4.Consider the development of a volunteer interpreter/ambassador program for downtown and the waterfront

A volunteer ambassador/interpreter program would provide visitors with opportunities to ask knowledgeable people for questions about attractions, history, and dining opportunities. As a related effort, consider the development of a virtual ambassador program, whereby visitors can obtain information via their cellular phones by scanning QR codes.

Funding:

- Town of Plymouth Promotions Fund Grant Program for uniforms, program management, and volunteer training

Responsible Parties:

- Plymouth Visitor Center
- Destination Plymouth

- Town senior volunteer program

Objective IV: Seek new opportunities for educational use of the Harbor/waterfront

Recommendation 1. Identify school and community groups as well as institutions of higher-education that might be interested in educational uses of/activities within the Harbor

Conduct outreach to local universities (e.g., Quincy College, Curry College, University of Massachusetts Boston, Massasoit College) and schools (Plymouth's public schools, for example) to identify their research and educational interests, and work with them to develop programs and facilities that meet their needs. Consider both shore-based and vessel-based opportunities, and look to them as a resource for conducting citizen science on topics such as invasive species, water quality, and marine debris. Potential efforts include an expansion of the town's existing shellfish program with the Charter School, and development of a water-front academic campus for interested institutions and organizations. As part of this, identify opportunities to engage students in construction projects to benefit the Harbor, such as the construction of floats.

Funding:

- Plymouth Educational Foundation
- Depending on the type of project, one possible funding opportunity is NOAA's B-WET program, which involves giving students meaningful watershed experiences.

Responsible Parties

- Local non-profit entities
- Local universities
- Plymouth Public Schools
- Plymouth Department of Marine and Environmental Affairs

Recommendation 2. Explore the possibility of developing a waterfront campus in North Plymouth for education and research purposes

Given the town's coastal resources and central location between Cape Cod and Boston, it is well-positioned to be a regional hub for coastal and marine innovation. With the development of a waterfront academic and research facility, the Town could provide space for research and development efforts pertaining to aquaculture, offshore energy, environmental sensors, and other industries.

Funding:

- Public/private funding opportunities

Responsible Parties

- Plymouth Regional Economic Development Foundation
- Local universities

Recommendation 3. Continue to provide and promote internship opportunities for college students

Internships provide students with hands-on experience to complement their studies, while providing town departments, companies, and not-for-profit organizations with increased capacity to complete discrete projects, such as shellfish seeding programs and mapping projects,

and/or ongoing efforts such as water quality sampling. The Town should encourage businesses and organizations to join them in seeking out and placing interns. Efforts should be made to target colleges, universities, and trade schools with harbor-relevant courses of study.

Funding:

- Explore the possibility of hiring unpaid interns who receive credit for their efforts

Responsible Parties:

- Department of Economic Development and Tourism
- Department of Marine and Environmental Affairs
- Local businesses and non-profit organizations

Recommendation 4. Work with the research vessel from Plymouth, UK to develop public education opportunities

The Mayflower Autonomous Research Ship will be coming to Plymouth for the 400th anniversary. The vessel is equipped with research equipment, and efforts should be made to provide events highlighting the vessel and local data collected in the Harbor and surrounding area. Educational opportunities might include public presentations and school presentations.

Funding:

- Plymouth Educational Foundation

Responsible Parties:

- Plymouth Area Chamber of Commerce
- Department of Economic Development and Tourism
- Department of Marine and Environmental Affairs

Recommendation 5. Identify opportunities to explore the Harbor's potential archeological resources

Little is known about the archeological resources in the Harbor and the surrounding coastal area. Efforts should be made to partner with experts to identify and explore potential archeological sites.

Funding:

- Archaeological Institute of America grants

Responsible Parties:

- Academic and professional institutions
- Plymouth Department of Marine and Environmental Affairs
- Land-owners

Recommendation 6. Identify opportunities to use the Harbor for boater and shellfishing courses

Venues around the Harbor could be used to conduct a variety of water-based courses for recreational users of the Harbor, including boater safety training courses and classes on how to recreationally shellfish.

Funding:

- Class fees could be used to off-set the cost of delivering the courses

Responsible Parties:

- Plymouth Department of Marine and Environmental Affairs
- Private companies

Appendix A: Implementation Matrix

The following matrix provides guidance on the priority status (high, medium, or low) of each recommendation in this plan. Furthermore, the matrix provides a rough timeline to start the process of implementing each recommendation. While some recommendations will be achievable in one year, many will require more than one year, and some – such as maintaining security in the harbor – will, by their nature, be ongoing.

The priority status and timeline for the recommendations in this matrix were established by the Plymouth Harbor Committee and the Plymouth Harbor Management Plan Committee during a joint meeting, with public input gathered during an April 2017 public meeting.

As a living document, it is anticipated that this matrix will be used to track progress on plan implementation; however, these timelines and priority statuses are subject to change as a result of factors such as new information, changes in regulations, availability of funding, and shifting environmental conditions. The matrix can and should be reorganized to reflect any necessary changes in timeline or priority status.

Plymouth Harbor Plan Goals, Objectives, and Recommendations						Timeline (Indicates START time. Implementation may be ongoing or take more than one year)					
Plan Topic	**Goal**	**Objective**	**Recommendation**	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
Dredging	Maintain Plymouth's waterways in a safe and navigable state for all users.	Ensure adequate dredging and funding to promote safe navigation in Plymouth Harbor	Develop a long-term dredging plan for all waterways within Plymouth Harbor, identifying dredging needs, costs, priorities, dewatering options, and possible funding sources	1	High	X					
			Acquire the necessary funding to complete dredge projects	2	High		X				
			Upon acquiring the necessary funding, complete dredging at key shallow areas as soon as possible	3	High		X				
			Utilize any suitable dredge spoil as beach nourishment in Plymouth	4	Medium	X					
			Explore less expensive and more sustainable options for dredging	5	Medium	X					
		Enhance the efficiency of the permitting process needed for dredging projects in Plymouth Harbor.	Develop a strategy for elevating Plymouth's dredging needs among those who make funding and permitting decisions.	6	High	X					
			Provide a means for the public and user groups to express their support of dredging projects.	7	High	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
Transient Boating	Improve infrastructure for transient boaters	Provide more dock and mooring space for transient boaters	Continue to provide transient space in the harbor at dedicated moorings and at private moorings, when possible	8	Low	X					
			Develop and implement a plan for adding transient space within the harbor	9	Medium	X					
	Increase the number of transient boaters visiting Plymouth Harbor	Offer amenities and services to transient boaters to increase transient visits and improve overall visitor experience	Improve access to key transient services (e.g., fresh water and fuel) at locations that minimize boater overcrowding (e.g., frequent congestion at Town Wharf)	10	Medium	X					
			Improve transient facilities	11	High	X					
			Improve launch services to meet the needs of boaters in the harbor by modifying the fee structure to include launch service, extending launch hours, and formalizing a contract with a launch provider.	12	Medium		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Offer special amenities to transient boaters to make their visits positive experiences	13	Low		X				
			Create short-term transient opportunities for those looking to get food at Woods, Cabby Shack, and other local restaurants	14	Medium		X				
			Increase availability of marine products for transients	15	Medium		X				
		Understand the financial impact of transient boating activity to the Town and region	Use Dockwa data and surveys of local businesses and transient boaters to assess the financial impact of transient boating activity to the Town and larger region.	16	High		X				
		Increase marketing to appeal to transient boaters	Increase advertising to attract transients and generate revenue for the town	17	Medium	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
Moorings	Revise moorings to increase capacity and enhance organization within the mooring fields	Install new moorings and reconfigure existing moorings	Increase the number of moorings available to boaters in the planning area	18	Medium	X					
			Either as part of a mooring expansion or smaller re-organization project, develop and implement a new mooring numbering system that allows boaters to quickly and easily locate moorings. Consider special markings for transient moorings.	19	Medium		X				
			Place transient moorings for the yacht club in one grouped location	20	Low			X			
			Maintain the online mooring map, updating mooring locations and other attributes of each mooring on an annual basis	21	Medium	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
		Ensure sufficient infrastructure to accommodate increased moorings	Increase the amount of dinghy space to meet current demand and ensure that any increase in the number of moorings includes expanded dinghy space or launch/tender service as appropriate	22	Medium	X					
			Improve shoreside space and parking for loading and unloading so mooring users can more easily transport their gear from their vehicles to the launch or to their dinghies	23	High	X					
Public Access	Provide access that will help elevate and position the waterfront as the commercial, recreational and cultural hub of the town.	Attract residents and visitors to the waterfront by improving accessibility to and along the waterfront.	Improve lighting along the harbor	24	Medium	X					
			Ensure adequate vehicle access to and parking for the waterfront and harbor	25	High	X					
			Support the Town's efforts to improve the quality, connectivity, and safety of pedestrian infrastructure to and along the waterfront	26	Medium	X					
		Maintain and improve visual access to the waterfront and harbor.	Additional parking lots, not located directly alongside the waterfront, should be considered	27	Low		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Consider developing dedicated viewing stations alongside the harbor	28	Low	X					
		Ensure adequate public access to the harbor and waterfront by vessel.	Explore opportunities to improve/expand ramp access	29	Medium	X					
			Improve ferry service to and from Plymouth Harbor	30	Medium			X			
			Explore opportunities for a community boat house	31	Low				X		
			Develop and construct more dock space for dinghies and small boats, and promote efficient use in these areas	32	Medium			X			
			Provide additional secure space for land-based small boat storage such as canoes and kayaks	33	Low		X				
			Expand for-hire boat service within the harbor	34	Medium			X			
		Increase types of access for recreation opportunities within the harbor.	Promote swimming in Plymouth Harbor	35	Low				X		
			Create seating opportunities in the town wharf area	36	Low	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Explore opportunities to improve the connection from Cordage Park to downtown Plymouth	37	Low				X		
			Maintain the integrity of the publicly-owned properties on Saquish while their potential for natural resource protection, public safety and/or public access is explored.	38	Low				X		
			Maintain safe public access at Brown's Bank and Plymouth Beach	39	High	X					
Fisheries	Increase aquaculture production in municipal waters	Provide infrastructure to support aquaculture operations	Explore opportunities to develop launch sites for growers so that they can quickly access their grants	40	High	X					
			Develop a Shellfish Advisory Board	41	Medium	X					
			Identify locations in the harbor suitable for floating upwellers	42	High	X					
			Explore opportunities for floating platforms upon which growers can process shellfish and store gear	43	Medium			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Ensure that programming at the new T wharf accommodates aquaculture needs	44	High	X					
			Continue to engage with the harbor stakeholders to ensure that aquaculture activities and practices minimize impacts to the environment and to other harbor users	45	High	X					
		Promote local aquaculture	Conduct educational activities to inform people about the benefits of aquaculture	46	High	X					
			Develop partnerships between private businesses and shellfish growers to increase the visibility of aquaculture as a new industry in the town	47	High	X					
	Maintain and improve Charter Boat businesses in the harbor	Improve infrastructure for charter fishing operations	Provide waterfront space for moored charter boats to advertise their services	48	Medium		X				
			Explore opportunities to increase access to power and water within the harbor for charter boat use	49	Medium		X				
			Ensure adequate dinghy space for charter boat operations	50	Medium		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
	Ensure that harbor activities support local commercial and recreational fishing activity	Improve infrastructure to meet the needs of the commercial and recreational fisheries	Increase the amount of dockage available for use by commercial fishermen	51	High	X					
			Consider developing a strategy for management of the mooring fields and waiting list that takes into consideration the specific needs of the commercial fishing industry	52	Medium	X					
			Identify locations in the harbor where lobsters could be live-stored by wholesalers until ready for market	53	Medium		X				
			Identify potential locations for a local lobster processing facility	54	High	X					
			Consider securing winter storage for commercial fishermen at Stephen's Field	55	Low			X			
			Improve ramp access for commercial fishermen	56	High	X					
			Expand the designated commercial parking area to include spaces near the town boat ramp	57	High	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Designate areas for loading and unloading of people and gear for commercial and recreational fishing	58	High	X					
			Provide improved commercial access to amenities including fuel, ice, wash-downs, and winches	59	High	X					
		Promote the local fishing industry as an attraction	Explore opportunities to highlight local commercial fisheries as a key feature of the harbor	60	High	X					
Natural Resources	Maintain and restore the town's natural resources	Preserve and restore habitats throughout the planning area	Continue efforts to restore and monitor diadromous fish runs	61	Medium		X				
			Continue to minimize impacts to eelgrass beds when siting activities in the harbor	62	High	X					
			Minimize damage to eelgrass from boating activity	63	High		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Continue to ensure that impacts to benthic habitat are considered when decisions are made regarding activities that could have a negative impact on the sea floor	64	High	X					
			Identify restoration projects that could be used as mitigation for other activities around the harbor	65	High	X					
			Acquire strategic parcels by fee or easement to protect and improve natural resource features such as water quality and habitat connectivity	66	Medium	X					
		Monitor and prevent invasive species	Continue to support invasive species monitoring in town waters and take measures to minimize the spread of invasive species	67	Medium			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Place informational signage at boat ramps to educate users about the importance of taking measures to prevent the spread of invasive species	68	Medium	X					
			Install invasive species disposal stations at the state and town ramps as well as at Steven's Field and Nelson Memorial Park	69	Medium		X				
	Develop an improved understanding of the town's natural resources	Engage in and support research projects involving local natural resources	Conduct research to understand the potential impacts of dredging on oyster beds and eelgrass resources	70	High	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Continue to partner to gather data on sharks	71	High	X					
			Explore opportunities to support a research program to understand the local seal population	72	Low		X				
			Support the Division of Marine Fisheries as they look to collect additional information about the potential causes of recent eelgrass loss in the area	73	High	X					
	Foster an appreciation of the town's natural resources that contributes to their protection	Provide opportunities for people to learn more about and care for their local natural resources	Continue to promote timely issues as well as the town's work on natural resource protection and restoration through the town website, local media, and social media	74	Medium		X				
			Promote Plymouth as a destination for eco-tourists	75	High			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Encourage behaviors that reduce the amount of trash in the ocean and coastal environment	76	High	X					
			Provide important water conservation information to residents	77	Medium		X				
			Increase public awareness of sharks, including their role in the ecosystem and ways to minimize personal risk	78	High	X					
Water Quality	Improve water quality in Plymouth	Maintain and improve water quality to support shellfishing and marine life	Minimize the impact of dredging on water quality	79	Medium	X					
			Continue to explore the opportunity to change the flow pattern at the waste water treatment facility	80	High	X					
			Explore opportunities to modify the discharge to the harbor from the waste water treatment facility	81	High	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Encourage compliance with No Discharge Area requirements	82	High	X					
		Minimize impacts of potential sewer breaks	Develop response plans to minimize the natural resource impacts caused by a sewer break	83	High	X					
		Reduce water quality impairments related to run-off	Develop an inventory and assessment of outfall pipes draining to the harbor and identify upgrades and improvements at each site to reduce the flow of un-treated stormwater to the harbor	84	Medium	X					
			Extend the sewer line to include commercial businesses along Warren Ave.	85	Medium			X			
			Ensure that any future development and re-development projects include storm water upgrades and other measures to improve water quality	86	Medium			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
		Increase public education	Conduct public education and outreach regarding the state of water quality in Plymouth Harbor and causes and impacts of impairments	87	Medium			X			
		Continue to collect water quality data to support water quality efforts	Continue municipal water quality data collection efforts	88	Medium	X					
Harbor Safety	To provide a boating environment that promotes safety and navigation among the multiple users within Plymouth Harbor.	To improve waterfront infrastructure and support patrol functions, thereby enhancing harbor safety	Install additional floats to alleviate space conflicts and ease daily operations	89	Low			X			
			Continue to work with the Coast Guard to ensure that aids to navigation are adequate, and continue to compliment the federal aids by adding private aids to navigation where needed	90	High	X					
			Continue to maintain security within the Harbor	91	High	X					
			Address potential hazards to navigation	92	High	X					
			Research the potential for a wave attenuator that could dampen impacts from storm	93	Low				X		

			surges, dangerous high tides, wakes, and waves								
		To accommodate and balance the various users of Plymouth Harbor, thereby enhancing harbor safety.	Improve safety for those using rental equipment in the harbor by increasing safety briefings and professionally guided tours and providing guidance on when rented paddle craft are allowed outside of the mooring fields/channel	94	High	X					
			Ensure that any efforts to increase transient use of Plymouth Harbor do not negatively impact other users of the harbor	95	Low			X			
		Increase signage providing information on (1) the risks associated with paddlesports/boating , (2) required safety gear, and (3) other rules and regulations.	Post signage specifically for users of non-motorized vessels at Steven's and Nelson's Field	96	Medium		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Develop and disseminate a brochure to highlight safety issues and suggested routes for non-motorized craft	97	Medium	X					
		Increase signage providing information on (1) the risks associated with paddlesports/boating, (2) required safety gear, and (3) other rules and regulations.	Add “no wake” signs to the jetty bridge and near the boat ramp to increase awareness of the regulation for people that may be new to the Harbor	98	Medium			X			
		Increase boating safety through education	Provide additional opportunities for boater education	99	Medium			X			
		Improve mooring safety	Maintain a list of town-approved mooring service providers and require boaters to use approved providers to service moorings	100	High	X					

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Improve efforts to increase awareness of regulations pertaining to mooring ownership i.e., a 3 year inspection is mandatory, not optional	101	High	X					
			Improve harbormaster's tracking of mooring inspections to flag those moorings not in compliance, and require the owner to show proof of inspection prior to resuming use of the mooring	102	High		X				
Climate Change	Improve the town's ability to respond to climate change impacts	Develop and foster a better understanding of the potential impacts of climate change in Plymouth and appropriate responses	Work with consultants to understand the potential impacts of climate change on harbor conditions	103	Low			X			
			Develop an education and outreach program designed to encourage the community to understand the potential impacts of climate change	104	Low			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Consider potential climate change impacts when constructing or modifying infrastructure	105	Medium	X					
			Continue to participate in FEMA's Community Rating System	106	Low	X					
Tourism and Education	Increase tourism in the Harbor	Elevate the harbor as a destination for vessel-based tourism	Encourage small cruise ships and tall ships to use Plymouth Harbor as a port of call	107	High		X				
			Encourage ferry day trips	108	Medium		X				
			Explore the possibility of a water taxi	109	Medium		X				
			Explore opportunities to bring fishing tournaments to Plymouth	110	High		X				
			Promote Plymouth Harbor as a welcoming place to boat	111	High	X					
		Develop opportunities to celebrate the Town's working waterfront	Develop new opportunities to celebrate the history of Plymouth's waterfront	112	High		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Encourage safe opportunities for members of the public to enjoy the working waterfront	113	Medium		X				
			Improve the blessing of the fleet celebration to draw more attention to the commercial fishing in Plymouth Harbor	114	Medium	X					
			Promote the Town's commercial fishing industry, while providing additional advertising and income-generating opportunities for fishermen	115	High	X					
			Ensure that the waterfront is celebrated as part of the 400th anniversary	116	High	X					
		Improve the connection between downtown and the harbor	Develop art exhibits that draw people from downtown to the harbor and identify locations for both temporary and permanent art installations along the waterfront	117	Medium			X			

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Install informational kiosks that include a list of events, a map, brochures, and important historical information related to the location of the kiosk	118	Medium		X				
			Draw visitors to the waterfront with additional shopping opportunities	119	Low			X			
			Consider the development of a volunteer interpreter/ambassador program for downtown and the waterfront	120	Medium		X				
		Seek new opportunities for educational use of the harbor/waterfront	Identify school and community groups as well as institutions of higher-education that might be interested in educational uses of/activities within the harbor	121	High		X				

Plan Topic	Goal	Objective	Recommendation	Rec #	Priority	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
			Explore the possibility of developing a waterfront campus in North Plymouth for education and research purposes	122	High			X			
			Continue to provide and promote internship opportunities for college students	123	High			X			
			Work with the research vessel from Plymouth, UK to develop public education opportunities	124	High	X					
			Identify opportunities to explore the Harbor's potential archeological resources	125	Low				X		
			Identify opportunities to use the Harbor for boater and shellfishing courses	126	High		X				

Appendix B: Fisheries Data

The following tables provide information about:

1. The specific endorsements held by Plymouth fishermen between 2000-2015
2. Dollar value of landed species, by species and year, 2005-2015
3. Live pounds landed in Plymouth each year, by species, from 2005-2015

Table B1: Endorsement Summary of Plymouth Harvesters, 2000-2015[64]

(Many of the zeros are related to the fact that endorsements were not available that year for that species)

*Indicates data restricted for confidentiality purposes

Endorsement	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AMERICAN EEL	0	*	*	*	0	0	0	*	*	3	3	5	6	6	5	5
CAP-NS MOBIL GEAR	*	*	*	*	*	*	*	*	3	3	3	*	*	*	*	*
CHARTER BOAT	0	0	8	13	17	21	20	22	19	21	23	0	0	0	0	0
DOGFISH	9	15	19	20	19	17	15	19	18	27	27	36	35	38	36	36
FLUKE	16	13	12	11	11	11	10	9	10	9	9	7	6	7	7	6
HEAD BOAT	0	0	*	*	*	*	*	*	3	4	4	0	0	0	0	0
HORSESHOE CRAB	4	7	5	9	9	8	8	6	7	7	6	5	5	5	5	5
HSC-BIOMEDICAL	0	0	0	0	0	0	0	*	*	*	*	*	*	*	*	*
LOBSTER	88	88	89	89	86	83	81	78	74	75	74	76	74	72	71	70
SCUP	11	15	14	17	16	14	17	18	18	19	19	23	22	24	22	22
SEA BASS	12	15	18	22	20	22	25	24	21	23	30	33	34	33	31	29
SEA SCALLOP DIVING	0	0	0	*	*	0	*	*	*	*	*	*	*	4	4	5
SEA SCALLOP SHUCKING	*	6	10	11	15	14	14	10	12	12	9	8	7	12	11	11
SHELLFISH	33	38	40	41	43	38	35	32	32	34	32	34	31	38	38	35
STRIPED BASS	42	63	77	91	87	83	80	79	73	83	79	86	84	97	95	95
SURFACE GILLNET	0	0	0	0	0	0	0	0	8	12	11	13	14	16	16	16
SW-GROUNDFISH	0	0	0	0	0	0	25	25	24	24	23	23	22	22	22	22

[64] MA Division of Marine Fisheries Permit Data. Personal communication.6/1/2016.

Table B2: Plymouth, MA Value (Dollars) by Species and Year, 2005-2015[65] (*Indicates data restricted for confidentiality purposes)

SPECIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BLUEFISH	647	935	2,616	*	2,236	*	1,570	1,096	283	3,664	2,628
BUTTERFISH	0	0	0	0	0	0	*	*	*	0	0
CLAM, NORTHERN QUAHOG	0	0	0	0	0	0	0	0	0	0	*
CLAM, RAZOR, ATLANTIC	0	0	0	0	0	*	0	0	*	0	*
CLAM, SURF	*	*	*	0	0	0	0	0	0	0	*
COD, ATLANTIC	202,295	144,300	224,377	131,275	131,966	163,880	236,372	52,019	*	*	*
CRAB, ATLANTIC ROCK	*	0	*	*	*	5,804	*	*	*	*	*
CRAB, GREEN	0	0	0	0	0	0	*	*	*	0	*
CRAB, HORSESHOE	*	*	*	0	0	0	0	3,625	*	4,005	*
CRAB, JONAH	0	0	0	0	*	*	*	2,968	*	*	*
CUSK	*	*	*	*	*	*	0	0	0	0	0
DOGFISH, SPINY	*	14,205	*	22,828	*	*	*	125,283	*	88,153	*
FLOUNDER, PLAICE, AMERICAN (DAB)	17,002	1,633	3,778	*	*	*	2,242	*	*	*	*
FLOUNDER, SAND DAB (WINDOWPANE)	*	*	*	*	*	*	0	*	0	0	0
FLOUNDER, SUMMER (FLUKE)	*	3,472	0	*	*	2,444	*	55,761	0	*	*
FLOUNDER, WINTER	144,072	68,253	137,755	99,129	101,381	*	50,580	*	*	*	*

[65] Data from the SAFIS Dealer database. Provided by MA DMF. Personal Communication. 5/31/2016.

Plymouth, MA Value (Dollars) by Species and Year, 2005-2015 (Continued)											
SPECIES	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
FLOUNDER, WITCH (GRAY SOLE)	87,712	14,888	*	*	35,601	*	*	*	*	*	*
FLOUNDER, YELLOWTAIL	129,879	89,015	83,061	71,408	64,856	*	42,032	*	*	*	*
GOOSEFISH	189,969	176,786	154,539	91,469	38,722	*	35,337	*	*	*	*
HADDOCK	37,596	5,883	6,909	*	*	*	2,229	*	*	*	*
HAKE, ATLANTIC, RED	0	0	0	0	0	0	0	0	*	0	0
HAKE, ATLANTIC, WHITE	1,139	6,193	802	*	*	*	*	0	0	*	*
HAKE, SILVER (WHITING)	*	*	*	*	*	*	1,446	*	*	*	*
HALIBUT, ATLANTIC	*	*	*	0	*	0	0	*	*	*	*
LOBSTER, AMERICAN	2,481,816	3,162,036	2,752,615	2,484,713	2,356,869	2,639,868	2,856,273	3,440,695	3,321,088	4,137,686	4,768,214
MACKEREL, ATLANTIC	*	*	*	*	*	*	*	*	*	*	*
MENHADEN	0	0	*	*	0	0	*	*	0	0	0
MUSSEL, BLUE	0	0	0	0	0	0	0	0	0	0	*
OYSTER, EASTERN	0	0	0	0	0	0	0	*	92,039	281,569	461,832
PERCH, OCEAN(REDFISH)	*	*	*	*	0	0	0	*	0	*	*
POLLOCK, ATLANTIC	2,802	9,026	5,014	*	*	*	2,577	*	*	*	*
SCALLOP, BAY	0	0	0	0	0	0	0	0	0	*	0
SCALLOP, SEA	18,357	*	*	*	*	125,420	*	41,149	*	362,139	*
SCUP	*	*	0	0	0	*	*	*	*	*	*

Plymouth, MA Value (Dollars) by Species and Year, 2005-2015 (Continued)											
SPECIES	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
SEA BASS, BLACK	*	*	0	0	0	*	2,126	6,471	*	7,125	*
SHRIMP, PANDALID	0	0	0	0	0	0	0	*	0	0	0
SKATE, LITTLE	0	0	0	0	0	0	0	0	*	0	0
SKATE, WINTER	*	*	0	0	*	0	*	*	0	*	*
SKATES	*	31,051	25,836	21,563	*	*	*	*	*	*	0
SNAILS(CONCHS)	0	0	0	0	0	0	0	0	*	0	*
SQUID, LONG FINNED (LOLIGO)	*	*	0	0	0	0	*	*	*	*	0
STRIPED BASS	14,150	7,237	19,686	21,611	26,746	2,542	44,444	27,824	7,743	104,948	103,329
SWORDFISH	0	0	0	0	0	0	0	0	0	0	*
TAUTOG	0	0	*	*	*	*	*	*	*	*	758
TUNA, ALBACORE	0	0	0	0	0	0	0	0	*	0	0
TUNA, BIGEYE	0	0	0	0	0	0	0	0	*	*	*
TUNA, BLUEFIN	*	*	*	*	*	36,561	*	89,212	63,691	*	*
TUNA, YELLOWFIN	0	0	0	0	0	0	0	*	*	*	*
WHELK, CHANNELED	*	*	*	0	0	0	*	*	0	*	*
WHELK, KNOBBED	0	*	0	0	0	0	0	*	0	*	*
WOLFFISH, ATLANTIC	1,943	1,197	*	*	827	*	0	0	0	0	0
SOURCE: SAFIS Dealer Database											

Table B3: Plymouth, MA Landings (Live Lbs) by Species and Year, 2005-2015[66]

*Indicates data restricted for confidentiality purposes

SPECIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BLUEFISH	1,362	1,719	5,577	*	2,767	*	2,912	1,685	765	3,629	2,804
BUTTERFISH	0		0	0	0	0	*	*	*	0	0
CLAM, NORTHERN QUAHOG	0	0	0	0	0	0	0	0	0	0	*
CLAM, RAZOR, ATLANTIC	0	0	0	0	0	*	0	0	*	0	*
CLAM, SURF	*	*	*	0	0	0	0	0	0	0	*
COD, ATLANTIC	140,305	96,786	135,085	86,064	112,133	119,266	129,185	25,885	*	*	*
CRAB, ATLANTIC ROCK	*	0	*	*	*	13,534	*	*	*	*	*
CRAB, GREEN	0	0	0	0	0	0	*	*	*	0	*
CRAB, HORSESHOE	*	*	*	0	0	0	0	4,064	*	4,123	*
CRAB, JONAH	0	0	0	0	*	*	*	5,374	*	*	*
CUSK	*	*	*	*	*	*	0	0	0	0	0
DOGFISH, SPINY	*	60,535	*	79,408	*	*	*	575,712	*	410,964	*
FLOUNDER, PLAICE, AMERICAN (DAB)	18,815	1,203	3,059	*	*	*	1,800	*	*	*	*
FLOUNDER, SAND DAB (WINDOWPANE)	*	*	*	*	*	*	0	*	0	0	0

[66] Data from the SAFIS Dealer database. Provided by MA DMF. Personal Communication. 5/31/2016.

Plymouth, MA Landings (Live Lbs) by Species and Year, 2005-2015[67] (Continued)											
SPECIES	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
FLOUNDER, SUMMER (FLUKE)	*	1,276	0	*	*	697	*	22,116	0	*	*
FLOUNDER, WINTER	109,287	34,084	71,173	50,648	61,791	*	26,989	*	*	*	*
FLOUNDER, WITCH (GRAY SOLE)	59,627	8,894	*	*	15,057	*	*	*	*	*	*
FLOUNDER, YELLOWTAIL	122,653	52,485	49,754	42,890	47,766	*	35,297	*	*	*	*
GOOSEFISH	163,852	151,402	137,600	64,704	28,406	*	24,277	*	*	*	*
HADDOCK	36,688	3,698	4,096	*	*	*	951	*	*	*	*
HAKE, ATLANTIC, RED	0	0	0	0	0	0	0	0	*	0	0
HAKE, ATLANTIC, WHITE	1,858	8,537	917	*	*	*	*	0	0	*	*
HAKE, SILVER (WHITING)	*	*	*	*	*	*	1,771	*	*	*	*
HALIBUT, ATLANTIC	*	*	*	0	*	0	0	*	*	*	*
LOBSTER, AMERICAN	495,105	673,391	563,690	639,204	700,044	680,858	808,190	1,039,903	976,060	1,006,675	1,060,595
MACKEREL, ATLANTIC	*	*	*	*	*	*	*	*	*	*	*
MENHADEN	0	0	*	*	0	0	*	*	0	0	0
MUSSEL, BLUE	0	0	0	0	0	0	0	0	0	0	*
OYSTER, EASTERN	0	0	0	0	0	0	0	*	29,071	84,841	138,973
PERCH, OCEAN(REDFISH)	*	*	*	*	0	0	0	*	0	*	*
POLLOCK, ATLANTIC	5,900	17,308	12,136	*	*	*	3,158	*	*	*	*
SCALLOP, BAY	0	0	0	0	0	0	0	0	0	*	0

[67] Data from the SAFIS Dealer database. Provided by MA DMF. Personal Communication. 5/31/2016.

Plymouth, MA Landings (Live Lbs) by Species and Year, 2005-2015[68] (Continued)											
SPECIES	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
SCALLOP, SEA	16,102	*	*	*	*	134,037	*	19,077	*	274,418	*
SCUP	*	*	0	0	0	*	*	*	*	*	*
SEA BASS, BLACK	*	*	0	0	0	*	724	5,268	*	7,342	*
SHRIMP, PANDALID	0	0	0	0	0	0	0	*	0	0	0
SKATE, LITTLE	0	0	0	0	0	0	0	0	*	0	0
SKATE, WINTER	*	*	0	0	*	0	*	*	0	*	*
SKATES	*	137,207	111,364	96,906	*	*	*	*	*	*	0
SNAILS(CONCHS)	0	0	0	0	0	0	0	0	*	0	*
SQUID, LONG FINNED (LOLIGO)	*	*	0	0	0	0	*	*	*	*	0
STRIPED BASS	6,539	2,959	8,229	7,387	9,011	9,724	15,802	9,890	4,178	24,219	29,821
SWORDFISH	0	0	0	0	0	0	0	0	0	0	*
TAUTOG	0	0	*	*	*	*	*	*	*	*	164
TUNA, ALBACORE	0	0	0	0	0	0	0	0	*	0	0
TUNA, BIGEYE	0	0	0	0	0	0	0	0	*	*	*
TUNA, BLUEFIN	*	*	*	*	*	5,958	*	10,027	10,263	*	*
TUNA, YELLOWFIN	0	0	0	0	0	0	0	*	*	*	*
WHELK, CHANNELED	*	*	*	0	0	0	*	*	0	*	*
WHELK, KNOBBED	0	*	0	0	0	0	0	*	0	*	*
WOLFFISH, ATLANTIC	6,734	2,447	*	*	1,202	*	0	0	0	0	0

[68] Data from the SAFIS Dealer database. Provided by MA DMF. Personal Communication. 5/31/2016.

Appendix C: Management and Regulatory Authorities

Descriptions of the management and regulatory authorities most relevant to harbor planning activities are below, organized by municipal, regional, state, and federal levels.

Municipal

Agencies/Departments/Committees

(listed alphabetically):

Plymouth Area Chamber of Commerce: This is a not-for-profit, private organization that provides resources for businesses and communities, including networking, workshops, and legislative advocacy.

Plymouth Board of Selectmen: The board typically consists of five members elected for three-year terms. The Board members oversee the operations of Plymouth government, making policy, reviewing budgets, setting fees, and enacting rules and regulations.

Plymouth Conservation Commission: The Conservation Commission works to uphold the state's Wetlands Protection Act and the Town's Wetlands Protection bylaw.

Plymouth Regional Economic Foundation: The Plymouth Regional Economic Development Foundation is a non-profit organization that strives to support employment and tax revenue growth, as well as diversify tax revenue in the Town of Plymouth.

Plymouth Department of Marine and Environmental Affairs: This department's mission is to protect the safety of people and vessels that use waterways and facilities, to provide for the protection and safe use of the town's natural resources, and to address environmental issues. Staff within this department include the Director, Harbormaster, Assistant Harbormasters, Shellfish Constables, Environmental Technicians, Natural Resource Wardens, and Animal Control Officers.

Plymouth Department of Planning and Development: This department coordinates all town agency activities relating to planning, community, and economic development.

Plymouth Department of Public Works: This entity has a number of divisions, including highway, maintenance, recreation, sewer, solid waste, and water. The department is responsible for general maintenance of the Town's infrastructure including sewer and storm water-related projects, and is leading the waterfront promenade initiative.

Plymouth Growth and Development Corporation: This organization operates as a government entity, and provides economic development for the community.

Plymouth Harbor Committee: The Plymouth Harbor Committee is composed of more than ten stakeholders, including the Harbormaster, fishermen, yacht club owners, natural resource directors, and others. The Committee reviews and makes recommendations on issues relating to the waterfront and Plymouth Harbor, and they initiated this process to develop a harbor management plan.

Plymouth Historic District Commission: Given Plymouth's importance as a historical destination, the Commission's mission is to preserve, protect, and document Plymouth's historical architectural heritage. The downtown-harbor area has a Historic District, and historic buildings within the district are protected by legislation.

Regulations:

Aquaculture: The Town's aquaculture regulations advocate for the development of aquaculture in municipal waters while minimizing impacts to existing activities such as navigation and the wild harvest of fish and shellfish. The regulation sets forth the application process including fees, timelines, and public noticing/hearing requirements. Furthermore, the regulations ensure active investment in each licensed area; establish criteria for license assignment, granting, renewal, and transfer; clarify the Town's authority to inspect licensed areas and enforce regulations; describe requirements for marking boundaries and gear; and address Town liability, including damage incurred as a result of activities such as dredging.

Beaches and Parks: Chapter 30 of the Town's bylaws addresses activities on beaches and in parks, establishing beach access requirements; prohibiting people from walking, driving, or riding horses on the sand dunes or grassy areas or over any other type of vegetation on all public beaches; prohibiting dumping and littering activities; establishing restricted beach access areas for

vehicles, and; prohibiting swimming on beaches where lifeguards have determined conditions to be hazardous to the health, safety and welfare of swimmers and bathers.

Harbor: Chapter 81 of the Town's bylaws covers harbor-related topics including speed limits, harbor signage, water-skiing, pollution, berthing, noise, reckless vessel operation, harbor fees, harbormaster regulations, mooring applications and permits, mooring specifications and minimum requirements, violations and penalties, and rules for Town-owned or managed boat ramps and boating access areas. The by-law also addresses boat storage, providing berthing guidelines which include:

- "Tie-up periods at town floats will be limited to 15 minutes. A tie-up time limit at the town floats or piers for visitors at night, or boats with breakdowns, will be limited by discretion of the Harbormaster[69]
- "Boat moorings cannot be rented out by owners and are assignable, when not in use, by the Harbormaster[70]
- "Boats shall not be tied to docks in dead storage without special permission from the Board of Selectmen. Any boat so illegally tied up for over four weeks' time will, upon notice from the Harbormaster, be removed [at the owners expense]"[71]

Shellfishing: The Town shellfishing regulations describe the seasons, digging areas, permit requirements, and catch limits established by the Board of Selectmen. The Harbormaster Department enforces the regulations and can make changes as necessary.

Wetlands: Chapter 196 of the Town's bylaws protects and preserves the Town's shores, rivers, wetlands, and other waterbodies. In particular, the bylaw focuses on minimizing impacts to the following wetland functions:

1. "Flood storage capacity, storm damage prevention, erosion and sedimentation control, prevention of water pollution and prevention of improper waste disposal, to protect the health and safety of persons and property.
2. "Protection of groundwater aquifers, public and private water supplies and water recharge areas, to maintain and preserve water resources.
3. "Protection of fisheries, shellfish, wildlife habitats and endangered plant species (as specified by the Massachusetts Natural Heritage Program), agricultural and aquacultural values and aesthetic and recreational values, to assure a stable quality of life.
4. "Control of floodwater and runoff, to assure the continuation of the natural flow pattern of the watercourses."[72]

Plymouth Zoning Bylaw: The Plymouth Zoning bylaw addresses several topics relevant to this harbor plan, including waterfront development. Section 205-46 identifies the following as its intent for the Waterfront District:

1. "To encourage the development of marine, history or tourism related land uses and activities which take advantage of the peculiar characteristics of the waterfront as well as its central location in Plymouth Center and its proximity to the historic area.
2. "To aid in revitalization of the central area by encouraging uses which attract people into the area and generate pedestrian-oriented activity.
3. "To complement the seasonal nature of the waterfront and tourist areas by establishing uses of year-round activity and vitality.
4. "To require special environmental design conditions for special permit uses to ensure, among other purposes, proper emphasis on a pedestrian environment, adequate pedestrian links between the proposed development and surrounding properties, high standards of site planning, and architectural design which is compatible with the adjoining historic area."[73]

[69] Plymouth Town Code. § 81-5(A)
[70] Plymouth Town Code. § 81-5(D)
[71] Plymouth Town Code. § 81-5(E)
[72] Plymouth Town Code. §196-1
[73] Town of Plymouth. Zoning Bylaw. §205-46.

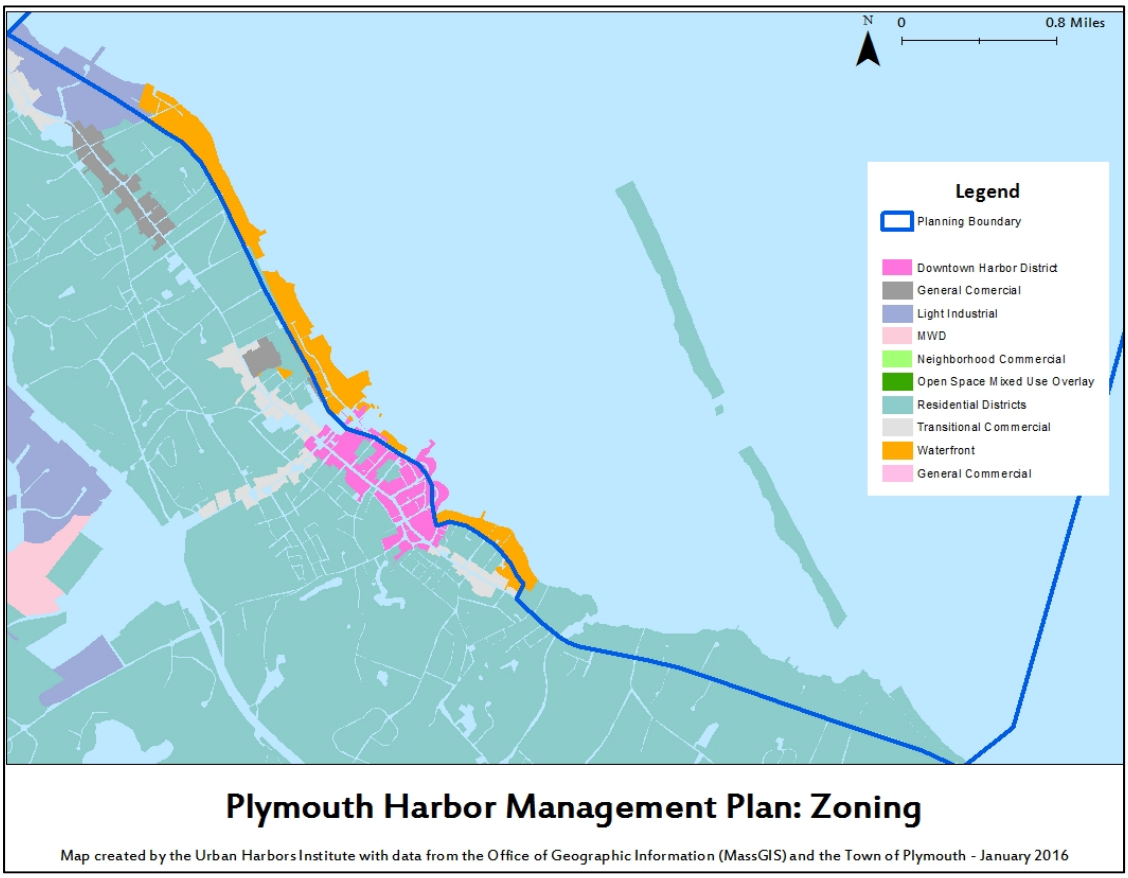


Figure: Zoning

The Light Industrial/Waterfront District allows uses such as "Boat sales, service, rentals, ramps and docks and commercial sightseeing or ferrying; marine railways, repair yards, storage yards, and marine supply outlets; Commercial fishing and seafood wholesale or retail outlets and related uses."[74]

The intent of the Downtown/Harbor District is:

1. "To encourage a mix of commercial and residential uses on individual lots and throughout the district that complement the Town's rich historical background.
2. "To create a pedestrian-oriented environment by creating links between existing and proposed areas of activity to better serve residents and tourists.
3. "To preserve and protect the distinctive characteristics of buildings and places significant in the history of Plymouth or their architecture, through the maintenance and improvement of settings."[75]

Relevant allowed uses within the Downtown/Harbor District include:

- "Boat sales, service, rentals, ramps, and docks and commercial sightseeing or ferrying
- "Marine railways, repair yards, storage yards, and marine supply outlets
- "Commercial fishing and seafood wholesale or retail outlets and related uses"[76]

The Floodplain District is an overlay district established to minimize public and private risk and loss due to flooding. Within the overlay are measures to prevent the alteration of any watercourse in a way that would result in flooding; ensure that development takes structural and non-structural measures—such as elevating a structure and incorporating drainage into site design.

[74] Town of Plymouth. Zoning Bylaw. §205-50.

[75] Town of Plymouth. Zoning Bylaw. §205-54.

[76] *Ibid.*

State

Agencies and Departments:

Massachusetts Department of Environmental Protection (DEP): The DEP works at the state-level to protect natural resources, prevent pollution, promote waste disposal and recycling, and address contamination cleanup. More specifically, the DEP oversees administration of the Massachusetts Wetlands Protection Act, hearing appeals of local Conservation Commission decisions, providing training, and developing policies and regulations. The DEP also issues Chapter 91 licenses; creates stormwater policy and assists communities with compliance under the MS4 program, support communities with local contamination issues, assists communities with dredging projects, and offers trainings on topics such as oil spill response. The Division of Water Pollution Control within the DEP enhances water quality and the value of water resources and minimizes water pollution through activities such as adopting standards of minimum water quality and certifying wastewater treatment facilities and sewer systems. The Division of Water Pollution Control enhances water quality and the value of water resources and minimizes water pollution through activities such as adopting standards of minimum water quality and certifying wastewater treatment facilities and sewer systems.

Massachusetts Division of Marine Fisheries (DMF): The DMF is engaged in fisheries and shellfisheries management, including activities such as issuing fishing and fish dealer permits; gathering fishing data such as catch reports; managing shellfish sanitation; and ensuring that habitats are protected, restored, and understood;

Massachusetts Office of Coastal Zone Management (CZM): CZM is the state's ocean and coastal planning and policy development agency with jurisdiction over than land and water from the seaward limit of the state's territorial sea to generally 100 feet landward of the first land transportation route. CZM assists communities with coastal planning issues such as climate change impacts and coastal development, providing regulatory guidance, technical expertise, and mapping resources.

Regulations:

Municipal Harbor Plans: Regulations for the "Review and Approval of Municipal Harbor Plans" (301 CMR 23.00), adopted in September 1990 by the Secretary of Environmental Affairs, a voluntary procedure by which municipalities could obtain state approval of a municipal harbor plan.

A municipal harbor plan is a document that (1) sets forth the community's objectives, standards, and policies for guiding public and private use of the land and water areas of a harbor, and (2) establishes an implementation program to achieve the desired plan. Some plans are approved at the municipal level; while greater influence over state decisions in a plan's planning area requires state approval.[77]

[77] A plan prepared and approved in accordance with these regulations (301 CMR 23.00) serves to guide EEA agency actions, including the regulatory decisions of the MA Department of Environmental Protection (DEP) under M.G.L. Chapter 91. When a state-approved harbor plan exists, any project seeking a Chapter 91 permit from DEP must be in conformance with that plan. In essence, a municipality with a state-approved harbor plan utilizes the state regulatory authority to help implement its own objectives. Through a locally-prepared state-approved harbor plan, a municipality has the ability to "substitute" local standards for certain state Chapter 91 requirements such as building height limits, and can "amplify" certain discretionary state standards.

The standards that can be substituted by a state-approved harbor plan apply only to non-water-dependent uses. Section 9.51(3) establishes minimum standards and limitations on building height, site coverage, waterfront setback, and encroachment into flowed tidelands. Section 9.53(2)(b)-(c) pertains to the provision of interior and exterior public space in a project. Section 9.52(1)(b)(1) is a requirement for a waterfront walkway with a minimum width of 10 feet to be included with any non water-dependent use. In those instances where non-water-dependent uses are allowed, this public access requirement exists, as does the ability to modify it through a municipal harbor plan.

The provisions of a state-approved municipal harbor plan can also be effective in providing guidance for DEP in applying the numerous *discretionary* requirements of the Chapter 91 regulations to projects under review.

Given this plan's scope and nature of recommendations, state-approval is not necessary for its implementation, and has not been sought. Nevertheless, this plan does meet the definition of a municipally-prepared harbor plan in that it sets forth the community's objectives, standards, and policies for guiding public and private use of the land and water areas and includes an implementation program.

MGL Chapter 21, Section 27: Chapter 21 establishes the duties and responsibilities of the Division of Water Pollution Control (MA Department of Environmental Protection), which are to: enhance the quality and value of water resources and to establish a program for prevention, control, and abatement of water pollution. The Division of Water Pollution Control is responsible for setting surface water quality standards and for issuing permits for activities including surface water and groundwater discharge, and sewer extensions and connections, as described in 314 CMR.

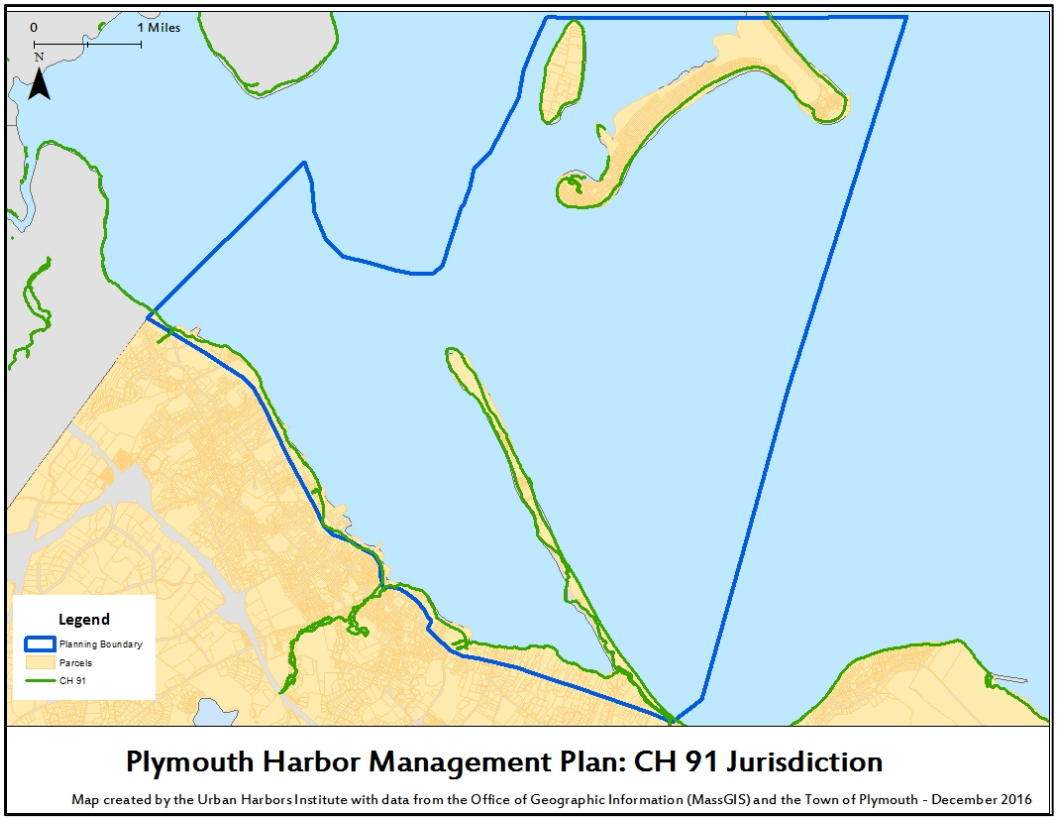
MGL Chapter 91 and the Massachusetts Waterways Regulations: Chapter 91, Massachusetts' principal waterfront regulatory program in tidelands and other waterways, and the corresponding Waterways Regulations (310 CMR 9.00) are administered by the Division of Wetlands and Waterways of the Massachusetts Department of Environmental Protection (DEP). Chapter 91 applies in tidelands, great ponds, and along certain rivers and streams. Tidelands refer to all land presently or formerly beneath the waters of the ocean, including lands that are always submerged as well as those in the intertidal area, i.e., below the mean high water mark. This area is governed by the "public trust doctrine" which establishes that all rights in tidelands and the water are held by the state "in trust" for the benefit of the public for the purposes of fishing, fowling, and navigation. The Waterways Act and its corresponding regulations codify the public trust doctrine in Massachusetts. As clarified by the 1983 amendments to the waterways regulations, Chapter 91 jurisdiction extends landward to the historic high water line and seaward three miles to the limit of state jurisdiction. The historic high water line is the farthest landward tide line which existed "prior to human alteration" by filling, dredging, impoundment or other means (310 CMR 9.02). Thus, Chapter 91 applies to filled as well as flowed tidelands, so that any filled areas, moving inland to the point of the historic high tide line, are subject to Chapter 91 jurisdiction. Chapter 91 authorization is generally required for any fill, structure, or use not previously authorized in tidelands, including any changes of use and structural alterations. Types of structures include: piers; wharves; floats; retaining walls; revetments; pilings; bridges; dams; and waterfront buildings (if located on filled lands or over the water). For planning purposes, the location of the historic high water line (i.e., upland limits of Chapter 91 jurisdiction) must be established through a review of maps that may reliably show the original natural shoreline or through engineering studies. Previously issued Chapter 91 licenses are also a source of information on the historic high tide line for specific parcels. Chapter 91 Jurisdiction is indicated on the figure on the next page, which shows the landward boundary.

Wetlands Protection Act: This act "protects wetlands and the public interests they serve, including flood control, prevention of pollution and storm damage, and protection of public and private water supplies, groundwater supply, fisheries, land containing shellfish, and wildlife habitat."[78]

Water Quality Certification: These regulations "implement Section 401 of the federal Clean Water Act in Massachusetts, by establishing permitting requirements to ensure that dredging projects, or proposed discharges of dredged or fill material, protect the public health and the Commonwealth's water resources."[79]

78 http://www.mass.gov/eea/agencies/massdep/water/watersheds/protecting-wetlands-in-massachusetts.html

79 http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-9-00-401-water-quality-certifications.html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CH 91
Plymouth Harbor Management Plan: CH 91 Jurisdiction
Map created by the Urban Harbors Institute with data from the Office of Geographic Information (MassGIS) and the Town of Plymouth - December 2016

Figure: Chapter 91 Jurisdiction

Federal

Agencies and Departments:

Federal Emergency Management Agency (FEMA): FEMA helps communities prepare for, protect against, respond to, and recover from/mitigate hazards ranging from fires to storms to earthquakes.

One of the agency's major initiatives relative to coastal communities is the National Flood Insurance Program (NFIP) and the Flood Insurance Rate Maps (FIRMs), which are the official maps on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community.

The following provides a further description of the zone designations:

- Zone AE: Areas subject to inundation by a 100-year flood (1-percent-annual-chance flood event). Base Flood Elevations (BFEs) are provided.
- Zone AO: Areas subject to inundation by a 100-year shallow flood (1-percent-annual-chance shallow flood event), usually sheet flow on sloping terrain, where average depths are 1-3 feet. Average depths are provided.
- Zone VE: Areas subject to 100-year flood (1-percent-annual-chance flood event) and additional velocity hazards (storm-induced wave action). Base Flood Elevations (BFEs) are provided at selected intervals.
- Zone X (unshaded): Areas outside the 500-year flood plain (less than 0.2 percent-annual-chance flood event). These are areas of minimal flood hazard from the principal source of flood in the area.
- Zone X (shaded): Areas within the 500-year flood plain (0.2 – 1.0 percent-annual-chance flood event). These are areas of moderate flood hazard from the principal source of flood in the area.

On the FIRM, the land area covered by the floodwaters of the base flood, i.e., the flood having a one percent chance of being equaled or exceeded in any given year (also referred to as the "100-year flood"), is the Special Flood Hazard Area (SFHA). The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO,

AR/AH, AR/A, VO, V1-30, VE, and V. Within the Special Flood Hazard Areas (SFHA), flood insurance is required for mortgages from a federally regulated lender if a structure is located in a flood zone.

In addition, FEMA oversees the National Flood Insurance Program's (NFIP) Community Rating System (CRS), in which Plymouth participates. CRS is a voluntary program that provides incentives to encourage community floodplain management that exceeds the minimum NFIP requirements. The three goals of the CRS are to: (1) Reduce flood damage to insurable property; (2) Strengthen and support the insurance aspects of the NFIP; and (3) Encourage a comprehensive approach to floodplain management. Managed by the Plymouth Conservation Commission, the Town's activities have secured a 5% discount on federal flood insurance.

These CRS goals are designed to reduce overall flood risk. A community therefore may earn discounted flood insurance premium rates through management actions that meet these goals.

National Oceanic and Atmospheric Administration (NOAA): NOAA plays an active role in the Town's fisheries, and provides important tools for climate change preparedness. NOAA's Office for Coastal Management provides resources for understanding and communicating local impacts to climate change such their sea level rise mapping and visualization tools; and NOAA offers competitive funding opportunities for coastal communities to increase their resiliency.

NOAA also works to implement the Magnuson-Stevens Fishery Conservation and Management Act, serving on regional fisheries management councils and developing fisheries management plans. The plans set forth requirements for topics such as catch limits and reporting, monitoring requirements, and gear specifications.

U.S. Environmental Protection Agency (EPA): As noted below, the EPA is authorized under the Clean Water Act to reduce point and non-point water pollution through the National Pollutant Discharge Elimination System (NPDES) program. Additionally, the EPA works with states to identify nitrogen and/or phosphorus-impaired waterbodies, such as Plymouth Harbor, and develop Total Maximum Daily Loads (TMDLs) to restore and protect water quality.

U.S. Army Corps of Engineers: The Corps of Engineers regulates work and structures that are located in, under or over navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899; the discharge of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act; and the transportation of dredged material for the purpose of disposal in the ocean under Section 103 of the Marine Protection, Research and Sanctuaries Act. "Waters of the United States" are navigable waters, tributaries to navigable waters, wetlands adjacent to those waters and/or isolated wetlands that have a demonstrated interstate commerce connection.

Regulations:

Clean Water Act: Section 404 of the Clean Water Act authorizes the Corps to regulate the discharge of dredged or fill material into "waters of the United States" which (as stated above) are all navigable waters, tributaries to navigable waters, wetlands adjacent to those waters, and other isolated wetlands that have a demonstrated interstate commerce connection. Regulated activities include the placement of fill for construction, site-development fill, riprap, seawalls, and beach nourishment.

Section 401 of the Clean Water Act gives states the authority, through a certification process, to ensure that federal permits are not issued in violation of state water quality standards. Within the Code of Massachusetts Regulations (314 CMR 9.00) the state's Water Quality Certification Regulations implement Section 410 of the Clean Water Act "by establishing permitting requirements to ensure that dredging projects, or proposed discharges of dredged or fill material, protect the public health of the Commonwealth's water resources"[80].

Also, under authorization of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) issues permits to all municipal, industrial, and commercial facilities that discharge wastewater directly from a point

[80] 314 CMR 9.00: 410 Water Quality Certifications. Online at: http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-9-00-401-water-quality-certifications.html

source into a receiving body as part of the National Pollutant Discharge Elimination System (NPDES) program. Permitted facilities include the Wastewater Treatment Facility.

Furthermore, the EPA's NPDES Stormwater program seeks to preserve and protect water quality by regulating discharges from municipal separate storm sewer systems (MS4s), construction and industrial activities, and other sources as designated by the EPA. The planning area is designated as an MS4 area based on density information obtained from U.S. Census data, and is subject to general permit requirements.

Rivers and Harbors Act of 1899: Section 10 of the Rivers and Harbors Act of 1899 authorizes the U.S. Army Corps of Engineers to regulate structures and other modifications of navigable waters of the U.S. Jurisdiction extends shoreward to the mean high water line in tidal waters, and to the ordinary high water line in non-tidal waters (fresh water). Regulated activities include construction of piers and wharves, permanent mooring structures such as pilings, intake and outfall pipes, boat ramps, beach nourishment, and dredging and disposal of dredged material, excavation, and filling.

The Corps' other major responsibility is to plan and carry out water resources projects such as improvements to navigation. Since 1986, the cost for such projects is shared between the federal government and the non-federal sponsors. An important consideration in the Corps' decision to undertake a project is that its benefits exceed the cost. For projects such as dredging of harbors and navigation channels, highest priority goes to projects that benefit maritime industry, such as shipping and fishing.

Magnuson-Stevens Fishery Conservation and Management Act: The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, signed into law on January 12, 2007, governs the commercial and recreational harvesting of fish in federal waters. The management of fisheries is conducted through the development and implementation of regional fisheries management plans. Plymouth is part of the New England Fisheries Management Council, which has fisheries management plans for northeast multispecies, sea scallops, monkfish, Atlantic herring, small mesh multispecies, spiny dogfish, red crab, skates, and Atlantic salmon. These science-based plans detail limits on harvest amounts; the numbers of fishermen that can participate in a fishery; how fish can be harvested; and where and when fish can be harvested.